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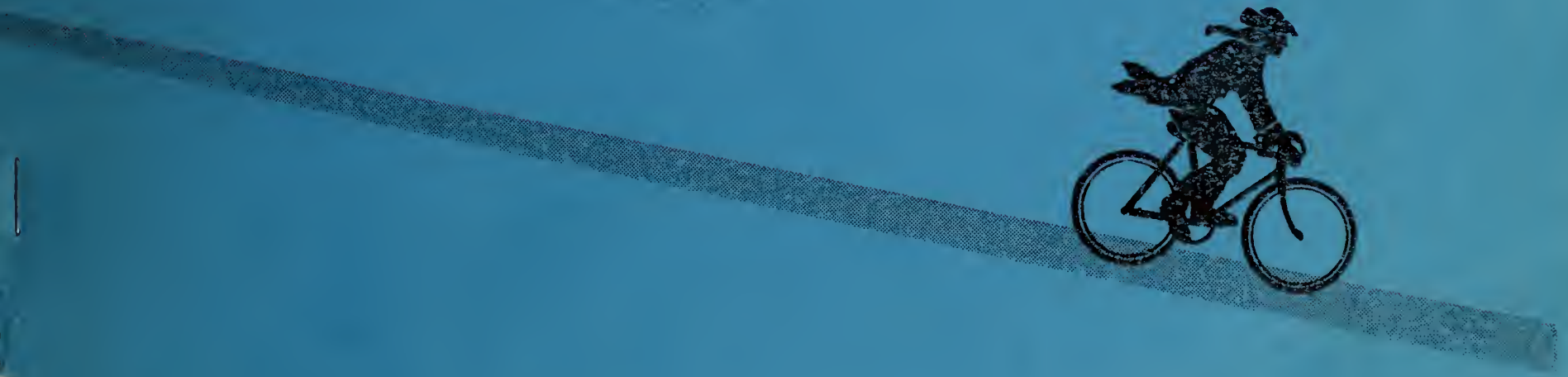
MINUTE MAN COMMUTER BIKEWAY STUDY



METROPOLITAN AREA PLANNING COUNCIL 44 SCHOOL STREET BOSTON, MASSACHUSETTS 02108

MARCH 1983

MINUTE MAN COMMUTER BIKEWAY STUDY

METROPOLITAN AREA PLANNING COUNCIL
44 School Street Boston, MA 02108

March 1981

UMTA Contract Number: MA-19-0006

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ABSTRACT

This study investigated the feasibility of constructing a 12-foot-wide, 11-mile-long commuter bikeway within the Lexington Branch railroad right-of-way from Cambridge to Bedford. The proposed Minute Man Commuter Bikeway would be the first of its kind in the MAPC region.

The report contains information necessary to determine the feasibility of this bikeway based on legal considerations, physical constraints, existing conditions, environmental concerns, maintenance and construction costs, and air-quality benefits. Further, a proposal for construction funding is also included along with a discussion of available funding sources, and specific recommendations have been made for the development of a maintenance program as well.

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INTRODUCTION

Purpose

This report has been prepared as an element of the Metropolitan Area Planning Council's air-quality-planning program. The program is funded by the United States Environmental Protection Agency under the provisions of Section 175 of the Clean Air Act Amendments of 1977, which are designed to assist regions not currently meeting the National Ambient Air Quality Standards.

In order to ensure local participation in areawide air-quality-planning programs, MAPC sought proposals from member communities for local projects to improve air quality in the region. One such proposal was the "Minute Man Commuter Bikeway," submitted by the town of Lexington in 1978.

MAPC organized the Minute Man Commuter Bikeway Working Committee as an initial planning measure to provide local and agency input to the study. Members include representatives from Arlington, Bedford, Cambridge, Lexington, and Somerville as well as from the Massachusetts Bay Transportation Authority, the Massachusetts Department of Public Works, the Massachusetts Executive Office of Environmental Affairs, the Metropolitan District Commission, and the Sierra Club.

The Committee reviewed preliminary findings and provided initial community and agency responses. Project recommendations were based on this review and response.

This study was conducted to examine possible air-quality benefits to be derived from the construction of an 11-mile, Class I, commuter bikeway along a railroad right-of-way and to determine the feasibility of doing so. The proposed bikeway would be built within the Lexington Branch right-of-

way and would extend from the proposed MBTA station/garage complex at Alewife Brook near the Cambridge/Arlington boundary to a point just west of South Street in the town of Bedford. See map 1, on page 3.

A Class I bikeway must be at least eight-and-a-half-feet wide. The depth of the pavement can vary, however, according to natural and/or manmade conditions. They are for the exclusive use of bicycles, completely separated from automobiles and off-limits to other motorized vehicles. Crossings are kept to a minimum.

In assessing the feasibility of this bikeway, legal considerations, physical and environmental constraints, maintenance considerations, and construction costs have been analyzed. Each of these matters is addressed in the chapter entitled "Issues pertaining to bikeway construction," in order that all issues may be reviewed before a decision is made on the merits of this proposal. A summary of existing corridor proposals as well as an analysis of air-quality benefits and projections of bicycle use are also included in the following chapters. All of this information has been considered in developing the study recommendations.

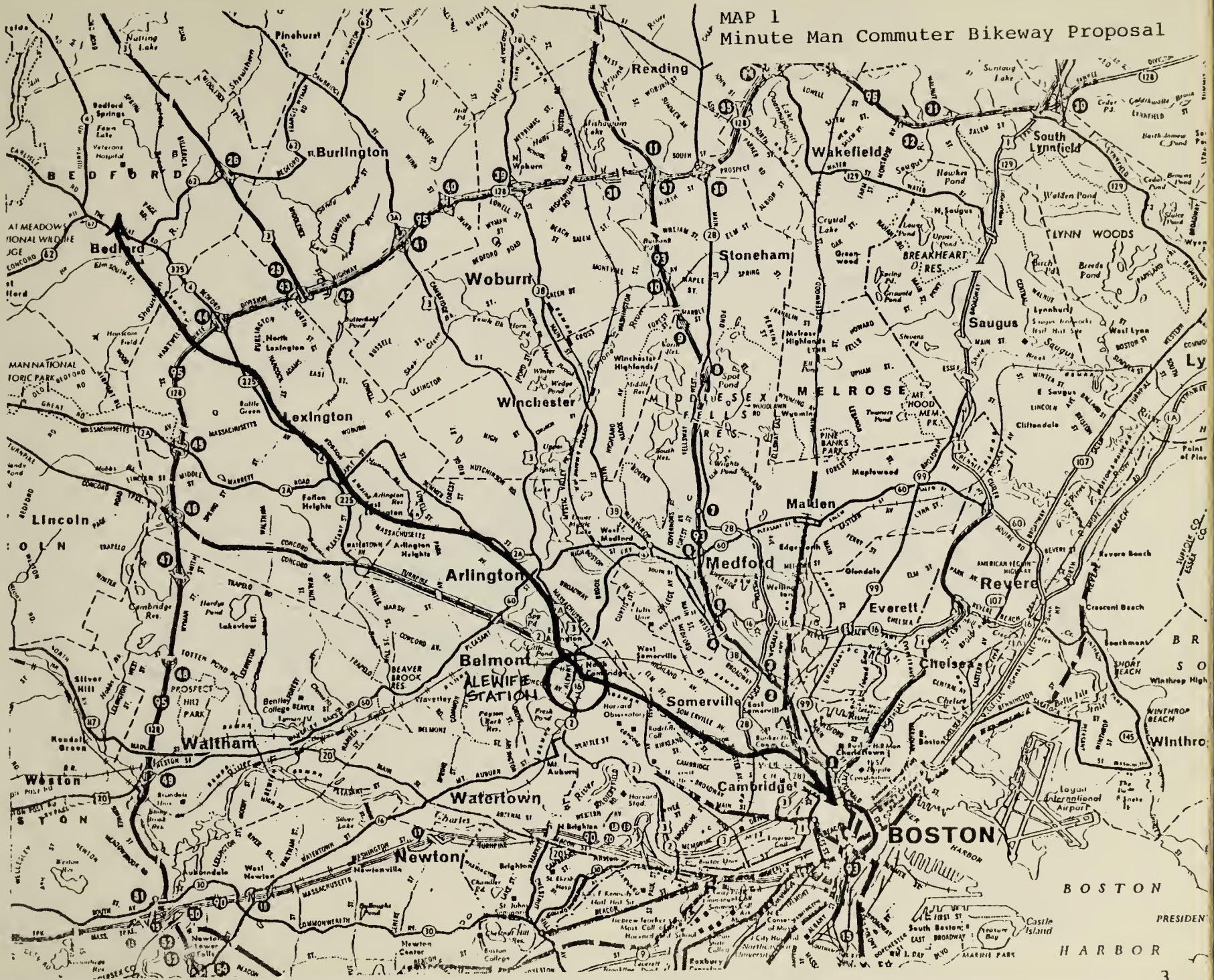
History of the right-of-way

Rail-passenger service between Boston and Lowell began in 1835, and by 1846 a branch had been built between Lexington and West Cambridge. This was the Lexington Branch, which by 1898 had some 29 passenger trains operating in both directions. Please see Map 2, on page 4.

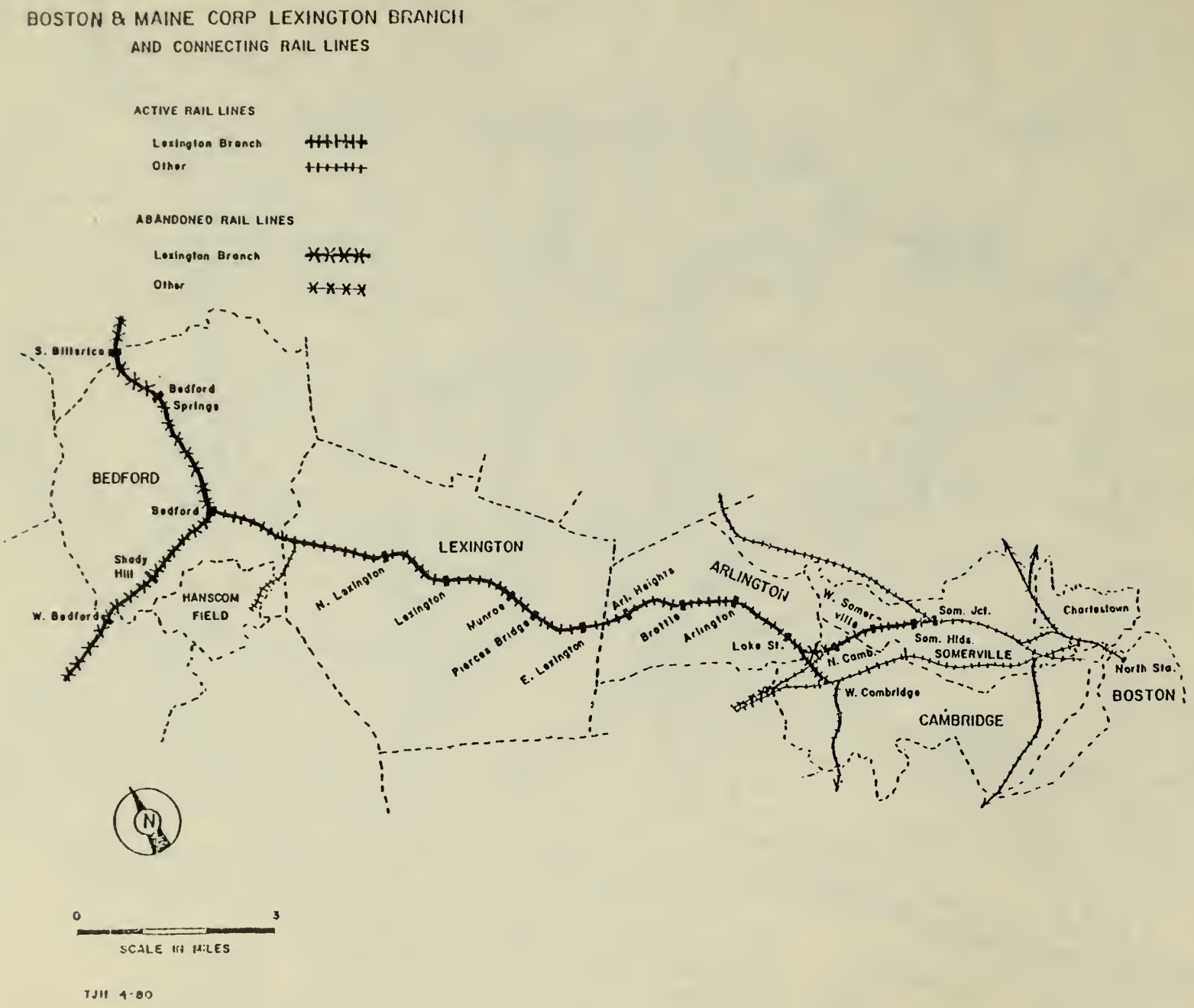
With the initiation of subway service from Harvard Square, in Cambridge, to Park Street in the early 1900s, it became possible, through a combination of connections, to make the trip from Lexington to Boston in less time for less money than by train.

Streetcars, then automobiles, accounted for less and less use of the

MAP 1
Minute Man Commuter Bikeway Proposal



MAP 2
Lexington Branch Rail Line and Stations



trains, and by 1915 railroad ridership had declined dramatically. Although ridership did increase temporarily during the war years (1941 to 1945), severe financial problems resulted in a further decline in service.

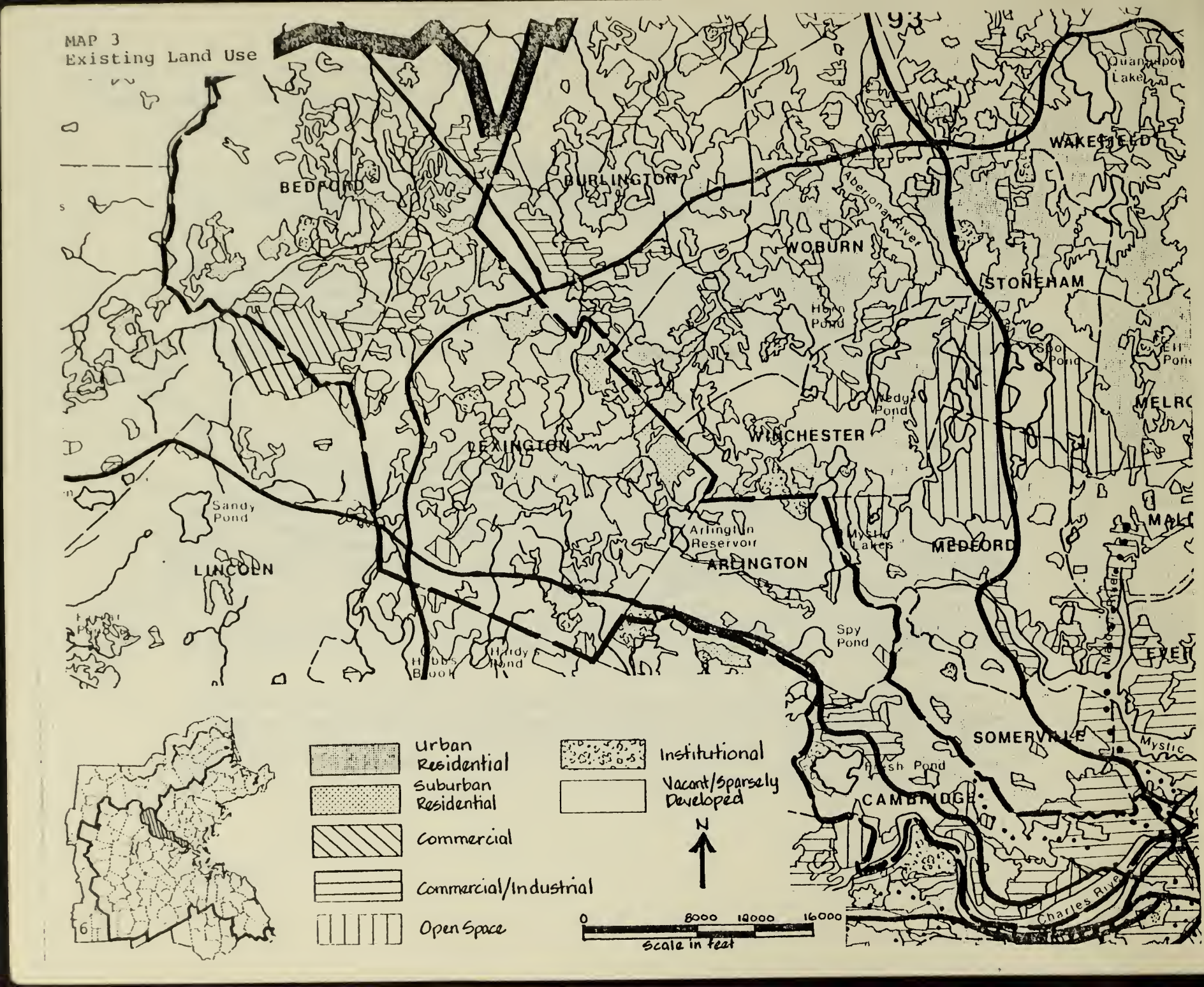
The Lexington Branch right-of-way was bought from the Boston and Maine Railroad by the Massachusetts Bay Transportation Authority in January 1977. Shortly thereafter, passenger service was suspended because of heavy snow on the track. This marked the end of passenger service on the Lexington Branch. A local freight service did, however, remain in operation.

Land use

Development in the Lexington Branch corridor is a mixture of residential, commercial, industrial, and open space. Residential densities range from multi-family and apartment complexes in West Cambridge to single-family homes in Lexington and Bedford. Commercial development, such as restaurants, gas stations, auto dealerships, bowling alleys, and shopping centers, is also scattered throughout the corridor, along with some light and heavy industry, design-and-research firms, and park, recreation, and conservation land.

While the more densely developed areas lie in West Cambridge/ East Arlington, the land becomes more open beyond Arlington Center and farther west in Lexington and Bedford.

Commercial areas include shopping centers at Fresh Pond, in West Cambridge, Arlington Center, Arlington Heights, and Lexington Center. Many of the corridor's design-and-research firms are located in other areas, such as along Hartwell Avenue in Bedford. See Map 3, "Existing Corridor Land Use," on page 6.


MAP 3
Existing Land Use
BEDFORD
BURLINGTON
WOBURN
STONEHAM
WAKEFIELD
LEXINGTON
WINCHESTER
ARLINGTON
MEDFORD
LINCOLN
SOMERVILLE
CAMBRIDGE
Sandy Pond
Arlington Reservoir
Mystic Lakes
Spy Pond
Hobbs Brook
Hardy Pond
Horn Pond
Wedge Pond
Aberjona River
Charles River
Mystic
Urban Residential
Suburban Residential
Commercial
Commercial/Industrial
Open Space
Institutional
Vacant/Sparsely Developed
N
0 8000 12000 16000
Scale in feet
6

SUMMARY OF RECOMMENDATIONS

Overview

Uninterrupted corridors of land are scarce in metropolitan areas, which usually makes it difficult to build bicycle paths. In this area, however, the MBTA right-of-way provides a unique opportunity for both a scenic and a functional commuter bike path having relatively few intersections with motorized traffic.

Because a properly implemented bikeway can complement the existing and the proposed transportation systems in this corridor, the following recommendations have been formulated to provide some solutions to the problems and concerns related to the construction and maintenance of this bikeway.

Construction recommendations:

1) Construct the Minute Man Commuter Bikeway to a 12-foot width using paving materials similar to those used in roadway construction.

2) Develop a lease between the communities and the MBTA for use of the Lexington Branch right-of-way for a specified period of time (25 to 30 years).

3) Develop bikeway access at grade-level crossings and otherwise where feasible, e.g., through adjacent parking lots and/or publicly owned property.

4) Install lights along the bikeway wherever the safety of cyclists would be enhanced.

5) Install safety barriers at above-grade points (areas where the right-of-way crosses above roadways).

6) Install safety railings at locations where the right-of-way crosses streams.

7) Plant for erosion control on slopes where appropriate.

8) Stabilize other slopes, where feasible, by making use of existing materials such as rails and/or ties.

9) Integrate the proposed bikeway with the existing traffic-flow patterns at the Arlington Center(Route 60/Massachusetts Avenue) intersection by installing the appropriate signs and pavement markings.

10) Install warning signs and pavement markings along the bikeway and intersecting roadways to alert both cyclists and motorists to the existence of the intersection.

Implementation recommendations:

11) Present appropriate evidence of local support for the proposed bikeway to the US District Court in coordination and cooperation with the MBTA and the Boston and Maine Railroad. But given the feasibility of joint use, the Court decision is of less importance. Therefore, an application for 100-percent MDPW construction funding should be prepared jointly by MAPC and CTPS.

Maintenance recommendation:

12) Negotiate a Memorandum of Understanding (MOU) among the communities of Cambridge, Arlington, Lexington, and Bedford specifying the type and level of maintenance each community is to provide for its segment of Bikeway. The MOU for maintenance could also include a statement outlining community commitment to policing the bikeway.

Joint-use recommendation:

13) Construct the 3.5-mile portion of the Minute Man Commuter Bikeway from Alewife to Arlington Heights in a manner that will accommodate the right-of-way's use both by trains and by bicycles.

Map 4, on page 11, shows the route of the proposed bikeway and location of recommended improvements along the right-of-way.

MINUTE MAN COMMUTER BIKEWAY

MAP 4 Plan Proposal

Prepared by
Metropolitan Area Planning Council, August 1980

Source
M D P W General Highway Maps Regional Series, 1975
Updated through field checks and community input, 1980

Funded by
Publication of this map was funded under the EPA Clean Air Transportation Planning Program, administered by EMEA

Drawn by
Nancy Waldman, Cartographer

6 indicates recommended action

Scale in Feet

0 2000 4000 6000

EXISTING PROPOSALS AFFECTING THE CORRIDOR

Background

A number of proposals have been made by the communities along the Lexington Branch right-of-way and by state and regional agencies that directly relate to its use. These proposals have been summarized to provide additional background on this area.

The recurring recommendation in the community and agency proposals is that joint or multiple use of the Lexington Branch corridor for transportation and development purposes take place.

Although each proposal has arrived at this conclusion for its own purposes, the result is the same: any future use of this corridor will have to involve a combination of services and facilities.

Community proposals

Cambridge

Alewife Revitalization-Alewife Urban Design Study, Phase II

The study was carried out by the Cambridge Community Development Department for the purpose of encouraging new development in the Alewife area that would lead to new jobs and a substantially expanded tax base, while not negatively affecting residential neighborhoods or already overburdened city services. Its purpose was to influence development decisions and guide the transformation of the area.

This 1979 study looked at the potential for growth and change in the Alewife area, investigated benefits and costs to the community of new development in the area, and formulated a comprehensive plan to manage growth that would result in the improvement of the natural and the

manmade environment in the Alewife area. The study concluded that the transformation of the Alewife industrial area from its present condition to one of an attractive, well-functioning employment complex would be gradual.

Bicycle and pedestrian paths were major elements in the study's access proposals. Development of the paths would occur after the construction of the MBTA Alewife station/garage complex is completed. This proposal is not in conflict with the proposed commuter bikeway.

The Fitchburg Freight Cut-Off Reuse Survey

This survey, also conducted by the Cambridge Community Development Department, in 1979 in North Cambridge, was an effort to determine how neighborhood residents viewed the long-range proposals for the B & M right-of-way in that area. Because the Red Line extension from Davis Square to Alewife is being constructed along this right-of-way in a tunnel, the land "created" on top of it will become available for use.

The North Cambridge residents were presented with three options: leave the area vacant, sell or lease the land, or use as neighborhood open space. The neighborhood-open-space option, which included a bike path, was preferred by 82 percent of the residents. The Fitchburg Freight Cut-Off connects with the Lexington Branch at Alewife.

Arlington

Arlington Center-Mill Brook Valley Plan

This plan, prepared in 1975 for the Town of Arlington, explored alternatives for use of the land related to the Lexington Branch right-

of-way. It addressed development, land use, and the steps that must be taken to develop a climate in which new development might occur. Recommendations included creating a park over the proposed Red Line tunnel that would link major community park and recreation areas and constructing pedestrian and bicycle facilities within this newly created park. Other recommendations provided for improved accessibility to shopping and residential areas, development of more housing and commercial acres, and improvements for pedestrians, such as wider sidewalks, benches, trees, and additional lighting along the south side of Massachusetts Avenue in Arlington Center. These recommendations are all consistent with the proposed commuter bikeway.

Lexington

The Minute Man Bicycle Highway

This proposal, submitted to the Metropolitan Area Planning Council in 1978, was suggested by the Town of Lexington as an air-quality project and was endorsed by the bicycle committees in Lexington and Arlington.

Bikeways are listed as one of the "Reasonably Available Control Methods" (RACMs) to assist in the reduction of automobile emissions.

Somerville

Bikeway Extension

A proposal that would provide links to the Minute Man Commuter Bikeway from Medford, Somerville, and Cambridge was submitted to MAPC by the Office of Planning and Community Development in Somerville. Suggestions for connections from Everett and Malden were also included in the proposal. To date, no definite planning efforts have been made on these proposed connections.

Agency proposals

Metropolitan Area Planning Council

Alewife Open Space

This report outlined a series of objectives and recommendations for the development of a park and open-space system at Alewife. Prepared in 1977, it was part of the Northwest Red Line Extension Joint Planning Program, an effort to coordinate development adjacent to new MBTA facilities. The report recommended that a bicycle and pedestrian-path network be established throughout the Alewife area.

Massachusetts Department of Public Works

Route 2 Traffic-Flow Improvements

The MDPW is developing plans that would improve the traffic flow on Route 2 while providing access to the MBTA Alewife Station complex from Route 2.

The most likely of the proposals includes ramps from Route 2 to the Alewife station, as well as eliminating the existing Dewey/Almy Circle at Route 2 and Fresh Pond Parkway and replacing it with a series of right- and left-turn lanes. The proposed improvement would enhance access and create the possibility of additional bicycle and footpath connections in the area.

The Massachusetts Bay Transportation Authority

Design-Criteria Report

This report, originally published in 1976, was revised in 1977 and again in 1978. It investigated and addressed the functional requirements for movement and access at the MBTA Alewife station complex. Access

recommendations included pedestrian and bicycle paths and bicycle racks within the Alewife station/garage complex. The Lexington Branch right-of-way was one alignment proposed for the bike path. This proposal is in harmony with the proposed Minute Man Commuter Bikeway.

Final Environmental Impact Statement (EIS) of the Red Line Extension Harvard Square to Arlington Heights

This three-volume environmental impact statement, prepared in 1977, looked at the environmental, social, and economic effects of the proposed Red Line extension from Harvard Square, in Cambridge, to Arlington Heights. The report documented existing conditions as well as plans and proposals that related to future use of the Lexington Branch right-of-way. The MBTA currently is constructing the portion of the extension from Harvard Square to Alewife.

The report determined, not surprisingly, that removal of the railroad tracks during construction would irreversibly commit the right-of-way to another mode of transportation.

Metropolitan District Commission

Draft Facility Plan-Mill Brook Valley Interceptor Sewer

This plan explores various alternatives for increasing the capacity of the existing sewer interceptors which serve Lexington, Bedford, and the Hanscom Field area. The alternative selected would provide an extension to Bedford's 24-inch force main by laying a line following the Lexington Branch right-of-way from Bedford Street to Hancock Street in Lexington. In addition, a proposed gravity-sewer extension would begin within the right-of-way at Hancock Street and follow it for nearly its entire length to the Lexington/Arlington town line. The proposed

sewer and connections are necessary if wastewater flows in excess of the existing system capacity is to be prevented from reaching the MDC Headhouse.

The U.S. Environmental Protection Agency has recognized that bikeways are compatible with sewer lines and encourages this type of joint development. The MDC is a member of the Minute Man Commuter Bikeway Working Committee and has indicated that it will make every effort to coordinate its construction work with that of the proposed bikeway.

Transportation alternatives

Bikeway is a generic term for a facility for bicycle traffic. There are three types: (1) bicycle route, (2) bicycle lane, (3) bicycle path.

A bicycle route has directional signs placed on existing roads, pointing out those streets for use by cyclists. A bicycle lane is a section of the roadway demarcated for bicycle traffic. A bicycle path is a separate facility built expressly for bicycles. Pedestrians, joggers, roller-skaters, and others not using a motorized vehicle (except wheelchairs) usually share bicycle paths.

A bicycle route provides information but usually little improvement in safety on a given street, although it can increase safety if it keeps cyclists on the safer streets and away from the more hazardous. The Boston-Cape Cod Bikeway, for example, is a bicycle route. They are most useful for longer trips, which are often made by cyclists who are unfamiliar with the area.

Bicycle routes are less useful for short trips for three reasons. First, short trips are usually made by cyclists familiar with the area, those least in need of guidance. Second, a cyclist making a short trip is less likely to detour to use a signed route. If his trip is only 10 blocks long, he will not detour two blocks for the bike route.

Finally, in a metropolitan area, cyclists are starting almost everywhere and going to many different destinations. A bicycle-route system would have to be very comprehensive. All the signs would add to the urban clutter and be expensive to maintain. A more efficient way to provide such information to cyclists in a metropolitan area is with a bicycle map.

A bicycle lane is a section of a road set aside for bicycles. In the bicycle-planning field, lanes are controversial. On the positive side, they seem to discourage wrong-way cycling, a leading cause of bicycle accidents. Also, the presence of a bicycle lane might encourage more safe bicycling, and might provide an extra margin of safety. But there is not enough statistical information to state definitively that bicycle lanes improve safety.

On the negative side, the bicycle lane cannot function through an intersection, where most accidents occur. The lane at intersections might even decrease safety if it discourages motorists and cyclists from merging correctly. Those who do not think the lane improves safety believe it would be irresponsible to encourage cycling by those who have little experience in traffic. A group of citizens in Arlington tried to have a bicycle lane placed on Massachusetts Avenue. While the proposal did receive initial approval from the Arlington Town Meeting, it was rejected by the Massachusetts Department of Public Works (MDPW). They did not think Massachusetts Avenue sufficiently safe.

Even if a bicycle lane were desired, it is appropriate only on streets wide enough to accommodate special bicycle space. The only corridor wide enough in the study area is Massachusetts Avenue. But Massachusetts Avenue in Cambridge and some sections beyond Arlington are even less desirable for a lane than the section in Arlington is.

The third type of bikeway is a bicycle path. It is separated from motor traffic except at intersections. A bicycle path is not safe if it crosses many driveways and streets, putting the cyclist in frequent conflict with motor vehicles. In such a case, the cyclist is probably safer in the street, being more visible to the motorists. If a path does not have frequent intersections, it can be a safe and pleasant alternative to the street system.

Bicycle paths are relatively rare, because uninterrupted corridors of land are scarce, particularly in metropolitan areas. As noted, the MBTA right-of-way provides a unique opportunity for a scenic bicycle path with relatively few intersections with motorized traffic.

Legal considerations

Both the current ownership and the use of the rail right-of-way are crucial to determining the feasibility of the proposed commuter bikeway.

In the interest of maintaining the Lexington Branch right-of-way as a transportation corridor, this study investigates the feasibility of using it for a commuter bikeway without eliminating the possibility of a future rapid-transit extension.

As noted earlier, when the right-of-way was purchased by the MBTA from the B & M Trustees, in 1977, the B & M retained the right to operate a freight service which serves several businesses in Arlington Heights. In August 1979, the B & M Trustees filed an application with the Interstate Commerce Commission (ICC) for permission to abandon that service. An increasing operating deficit was cited as the reason. Following prescribed procedure, the Trustees filed a notice in April 1980, with the United States District Court in Boston, for issuance of an order authorizing the termination of the freight service. Again, the action was attributed to financial conditions. To allow time for all interested parties to be notified, the judge scheduled a hearing for later that month. The petition was opposed by E.W. Larson & Sons Incorporated, a building-supply company on Mill Lane in Arlington Heights.

The decision, rendered on September 9, 1980, allowed a temporary discontinuance of the freight service in order to permit the MBTA to construct the Red Line extension from Somerville's Davis Square to Alewife Brook Parkway, as well as the station complex in the Alewife Brook area.

The court order provides that "the Trustees shall not permit any

part of the rail, track, ties or structures of the Lexington Branch used for freight service to be dismantled or removed from the right-of-way, except approximately 1300 feet of track, and the signal system accessory to the track, lying in West Cambridge and East Arlington, to permit construction by MBTA of the complex consisting of the garage and subway station...." It further provides that the trustees cooperate with the freight shippers remaining on the line by furnishing reasonable rail service at alternative public delivery track facilities in Cambridge and Waltham, and that they report to the court within six months on the progress of the MBTA construction, plans for rapid-transit extension beyond Alewife, or other use of the Lexington Branch corridor.

In summary, the court has left the door open on a ruling for permanent abandonment of freight service by allowing for this review of planning and construction status.*

Physical constraints

The width of the right-of-way is a major factor that must be considered both in determining the feasibility of the bikeway and in exploring the possibilities of joint use. In some areas, such as Arlington Center and downtown Lexington at the railroad station, the right-of-way narrows to 15 feet. In other areas, where the rail line passes through conservation land or sparsely developed areas, it reaches a width of 82.5 feet. Such variation makes careful planning mandatory, to ensure that the transportation system in this corridor is coordinated.

Safety hazards are mainly at grade-level crossings where the right-of-way is intersected by a roadway or passes through a major intersection. These occur to some extent in all of the communities adjacent to the right-of-way.

---

*Please see page 84 in the Appendix for additional discussion relative to the freight service.

Intersections that are of primary concern include: Arlington Center at Route 60 and Massachusetts Avenue, Bedford Street in Lexington, South Street in Bedford, and the intersection of the Lexington Branch with main commuter and freight lines at Alewife, in Cambridge. Others, such as Lake Street in Arlington and Meriam, Woburn, and Hancock Streets in Lexington, could also present problems and therefore deserve special attention.

If joint use of the right-of-way were developed, safety barriers would be necessary to separate the uses. However, if the MBTA extension beyond Alewife goes underground, the commuter bikeway could be constructed above that extension, which would create a separation of uses.

Barriers might be appropriate on the bridges to ensure the safety of bicycle riders. These bridges include the six that are above-grade as well as the three that cross streams.

The three bridges that cross streams are wooden and appear well-preserved. These will need suitable decking material to accommodate the bikeway. The six bridges that are above-grade are either steel and wood or steel only. Their condition is fair to poor. Most of these have wide abutments that could accommodate the bikeway to one side of the existing tracks. They would require planking or other similar surface treatment to provide a suitable base for decking materials.

Tracks and ties also affect the construction of the proposed bikeway in this right-of-way. If they were left in place and paved over, the surface would eventually become rutted and uneven. Therefore, to accommodate the bikeway, the tracks and ties should be removed and the surface graded and prepared before application of the paving material.

Environmental constraints

Erosion has taken place on some of the slopes adjacent to the bridges. During bikeway construction this should be corrected using the best available techniques. The stabilization of these areas, in addition to enhancing the overall design of the bikeway, will also provide a pleasing view for abutters.

In the Alewife area, where the right-of-way crosses Little River, and in Bedford, where it crosses the Shawsheen River and Elm Brook, bridge construction must employ the best engineering techniques to ensure that this activity does not cause any additional pollution of these water resources.

Maintenance costs and considerations

Maintenance is often one of the more complex considerations and one for which there is no overall provision in any existing funding program. At present, bikeways constructed on state property are maintained by state agencies, while responsibility for maintaining local facilities is assumed by the communities that construct them. However, this proposed bikeway does not fall within either of these two categories because it is a multi-community project.

Some potential solutions, such as amending the existing MDPW Bikeway Bond Program to include a provision for maintenance funding or extending the MDC Parks District to include the total length of the bikeway, could require legislative action. Others, like a Memorandum of Understanding (MOU), for example, simply could require that all parties to the agreement commit themselves to a specified standard of maintenance.

Standard maintenance for this bikeway should include sweeping, pavement and sign repairs, cutting brush, trimming trees, and clearing away cuttings. Additional costs would be incurred if lighting were installed or if the bikeway were to be plowed in winter.

The cost of maintenance could range from a low of $1,600.00 annually per mile for standard procedures to a high of $2,329.00 annually per mile for standard procedures, maintenance of lighting, and snow plowing.

The following table contains a breakdown of annual per-mile costs as well as system totals for varying levels of maintenance.

TABLE 1

Annual Per-Mile & System-Maintenance Cost Estimates

Type of Maintenance	Cost Per Mile	Cost For System
Standard procedures (including sweeping, repairs, cutting & clearing)	$1,600	$17,600
Standard procedures plus plowing	1,820	20,020
Standard procedures plus repairs/replacement of lights & fixtures	2,110	23,210
Standard procedures plus plowing & repairs & replacement of light fixtures	2,330	25,630

Annual maintenance costs have been projected by adjusting the figures to reflect the miles of bikeway within each community. The following table contains those cost breakdowns for each community.

TABLE 2

Annual-Maintenance-Cost Estimates by Community

	TYPE OF MAINTENANCE			
Community	Standard Cost	Standard plus plowing Cost	Standard plus light-repair/replacement cost	Standard plus plowing plus light-repair/replacement cost
Cambridge	800	910	1,055	1,170
Arlington	6,400	7,280	8,440	9,320
Lexington	8,800	10,010	11,605	12,810
Bedford	1,600	1,820	2,110	2,330
Total	17,600	20,020	23,210	25,630

Note: MAPC estimates in Tables 1 and 2 are based on data obtained from McGraw/Hill's 1980 Dodge Guide to Public Works and Heavy Construction Costs and Linear Parkway Study, Bay Area Rapid Transit Urban Beautification Demonstration Project, San Francisco, California, June 1974.

Construction costs

In estimating construction costs, a full range of amenities must be considered. Among those necessary for this particular facility are safety barriers, landcape planting and planting for erosion control, pavement markings and signing (informational and directional both on and leading to the bikeway), bridge repairs and/or reconstruction, intersection improvements (which might include signal devices), lighting in some areas to promote safety, and pavement width and type. Because this bikeway is planned for a railroad right-of-way, track- and tie-removal costs must also be included.

There are several funding sources for bicycle facilities and programs. Many of the federal ones relate to existing federal programs (e.g., the Department of Transportation, the Department of Interior, the Department of Housing and Urban Development, the Environmental Protection Agency, the National Endowment for the Arts, and others). The requirements and procedures for obtaining funds vary from program to program and from state to state. The Appendix contains brief descriptions.

In 1975, Massachusetts initiated its own program to provide construction funds for bicycle facilities by authorizing a transportation-bond issue with an allocation for bikeways. By 1977, that allocation had reached $2 million. The funding program, with a 75 percent state - 25 percent local match, is administered by the Massachusetts Department of Public Works. The Department has been very open to accepting in-kind services as a part of the local share. However, construction of regional facilities may be eligible to receive 100-percent funding under the bikeway-bond program. Additional information, which outlines application requirements, is provided in the Appendix.

Existing cost estimates for the construction of a Class I bikeway range from a low of $50,000 per mile to a high of $75,000 per mile. These

figures include standard amenities such as pavement markings, safety barriers, and some landscaping, but do not include the cost of lighting, removal of railroad tracks and ties, or intersection improvements. With these additions, the per-mile cost for construction could reach $170,200.

The following chart gives projected costs both per-mile and system-wide for various amenities for a 12-foot-wide commuter bikeway with highway pavement.

TABLE 3

Construction-Cost Estimates for Class I Bikeways

Type of Construction	Cost Per Mile	Cost For System
Standard facility with no major additions	$50,000	$550,000
Facility with minor intersection improvements	55,000	605,000
Facility with major intersection improvements	85,000	935,000
Facility w/intersection improvements & track & tie removal	120,000	1,320,000
Facility w/intersection improvements, track & tie removal, & some lighting	138,200	1,520,200
Facility w/maximum improvements, some lighting, & track & tie removal	170,200	1,872,200

Note: MAPC estimates are based on data taken from the Massachusetts Department of Public Works, Bikeway Planning Information, and McGraw/Hill's 1980 Dodge Guide to Public Works and Heavy Construction Costs.

The Metropolitan District Commission's proposal to install a relief sewer along the right-of-way within Lexington could change construction-cost estimates for that portion of the proposed bikeway. The MDC has indicated that they would include rough grading as a part of the sewer project if it is necessary for them to remove tracks and ties when they proceed. This could reduce the cost of the Lexington segment of the proposed bikeway by some $40,000 per mile and the system cost by $220,000.

DEMAND ANALYSIS AND IMPACT ON AIR QUALITY

Rationale

The Environmental Protection Agency has identified a set of transportation-control measures that could improve air quality. These are officially called Reasonably Available Control Measures--RACMs--and bikeways are among them.

One task of a study such as this is to quantify the impact on air quality of the proposed project. To do so, an estimate must be made of the automobile trips, or vehicle miles traveled (VMTs), that do not occur because of the existence of the bikeway. The estimated reduction in VMTs is then translated into reduced vehicular emissions.

Demand analysis

The demand for a bikeway is determined by estimating the number of bicyclists who would use it. This future group can be divided into four categories:

1) those who currently bicycle;
2) those who would switch from transit to bicycle;
3) those who would switch from auto to bicycle; and
4) those who currently don't make the trip.

Only some of this demand, of course, will have an effect on air quality. Category 1 users simply will bicycle on a new facility but will not decrease VMTs. Category 2 users would have an effect only if so many people switched that bus service was decreased or if the resulting empty seats attracted drivers or auto passengers. Since these scenarios are unlikely, it's assumed that Category 2 users will have little effect on VMTs.

Category 3 users will be either former drivers or former passengers. A driver who switches to bicycling reduces VMTs (althouth there's no benefit if another individual goes and uses the now-free car for new trips). A passenger who switches brings about no VMT reduction if the auto trip that took him is still made anyway--as in the case of one person in a four-person car pool who began bicycling. VMT reduction here results when the auto trip was made only for the sake of the former passenger. (Sometimes such an event would be of double benefit, as when both a dropoff and a later pickup were involved--for example, with a child or teenager.)

Category 4 users, those who at present do not make the trip, would have no effect on air quality.

Demand analyses are routinely performed for new highway and transit projects. These analyses are used to determine projected traffic levels and are then used with other information either to justify a given project or to aid in its design.

Land-use and socioeconomic data, such as number of households, auto availability, and location of employment centers, are used in estimating the number of trips that will be made. These are then separated according to the availability and cost of the various modes of transportation. Cost is further defined both in dollars and in time. Although much information has been gathered to develop these relationships, traffic and/or ridership forecasting for highway and transit facilities is an inexact business.

Not surprisingly, then, forecasting numbers for bicycle facilities is virtually unheard of. Very little information exists on how many people currently bicycle, their characteristics, and the numbers that

are attracted to new facilities. As stated in the EPA's Bicycle and Air Quality Information Document, "Bicycle measures should be viewed as demonstration measures, whose effects are expected to be generally positive, but whose magnitude of impact is still unknown."* The proposed Minute Man Commuter Bikeway's impact on air quality will be assessed to the extent possible with available information.

Existing traffic volumes

Step one in this process is collecting base data. Bicycle-traffic counts were taken at key intersections in the study area. Map 5 indicates the locations of these counts.

It is desirable to determine bicycle volumes on streets that are now being used but might not be if the bikeway were available. This allows an estimate of demand for the bikeway from existing cyclists. Bicycle-traffic counts taken at the same locations subsequent to the construction of the bikeway should give a clear indication of the number of these cyclists that switched to the new facility. It is also desirable to count bicyle traffic at points near the termini of the bikeway to determine relative volumes. For example, given population density, it is expected that volumes in Cambridge would be higher than those close to Bedford.

A CTPS study conducted in 1976 contains bicycle counts for two locations that are relevant to this study. These are Massachusetts Avenue at Pleasant Street in Arlington and Porter Square, in Cambridge. Counts done at these locations in 1980 provide a picture of the change in bicycle use in the last four years.

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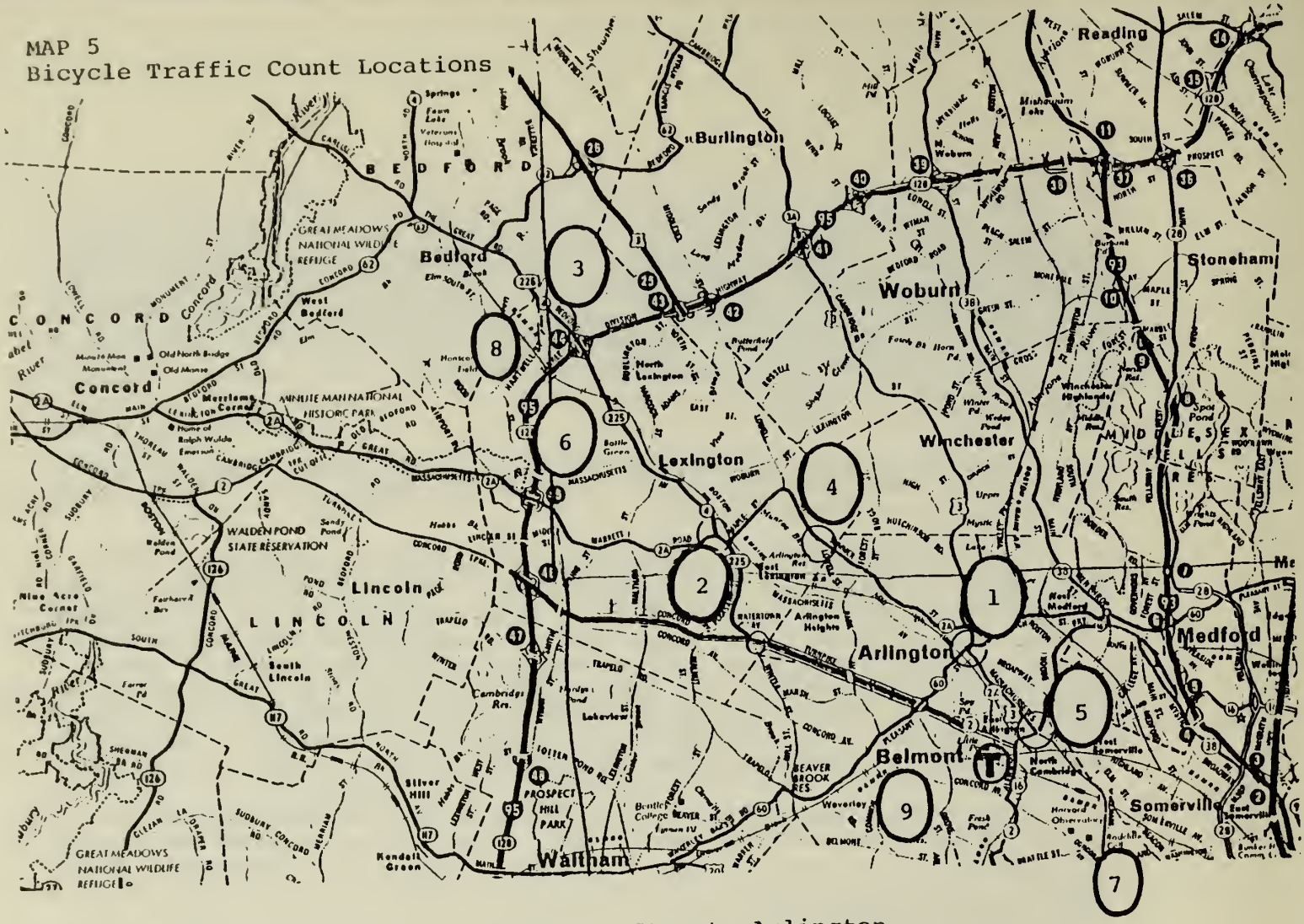
*September 1979 report, page 67.

MAP 5
Bicycle Traffic Count Locations



1. Massachusetts Avenue at Pleasant Street, Arlington
2. Massachusetts Avenue at Route 2A, closest to Lexington Center
3. Hartwell Avenue at Bedford Street, Lexington
4. Lowell Street at Summer Street, Lexington
5. Massachusetts Avenue at Alewife Brook Parkway, Arlington/Cambridge
6. Wood Street at Massachusetts Avenue, Lexington
7. Porter Square, Cambridge
8. Hartwell Avenue, Maguire Road, Lexington
9. Concord Avenue, Blanchard Road, Belmont

CTPS 8/80

The new counts were done at nine locations simultaneously, from 4 p.m. to 6:30 p.m., on Wednesday, September 24, 1980. This was a day with weather conditions favorable to cycling* (inclement weather will be taken into account later). September is an average month for bicycle traffic and Wednesday is an average day.**

Figures 1 through 3 indicate the peak-hour and total bicycle volumes at the nine intersections. Peak-hour volume is that which occurs at an intersection during the busiest hour counted. The total volume is for all bicycles that passed the intersection from 4 p.m. to 6:30 p.m. Figure 4 indicates both the peak-hour volume at each intersection and when that peak hour began. The peak-hour volume at Massachusetts Avenue and Route 2A in Lexington is, for example, 49 bicycles, and occurs from 5 to 6 p.m.

As would be expected, the largest volumes are where population and employment are highest, nearer Boston and Cambridge, with the very largest occurring in Porter Square. Continuing out the Massachusetts Avenue--Route 4/225 corridor, the peak-hour volumes are 68 at Alewife Brook Parkway, 79 in Arlington Center, 49 at Route 2A, and 24 at Hartwell Avenue in Lexington.

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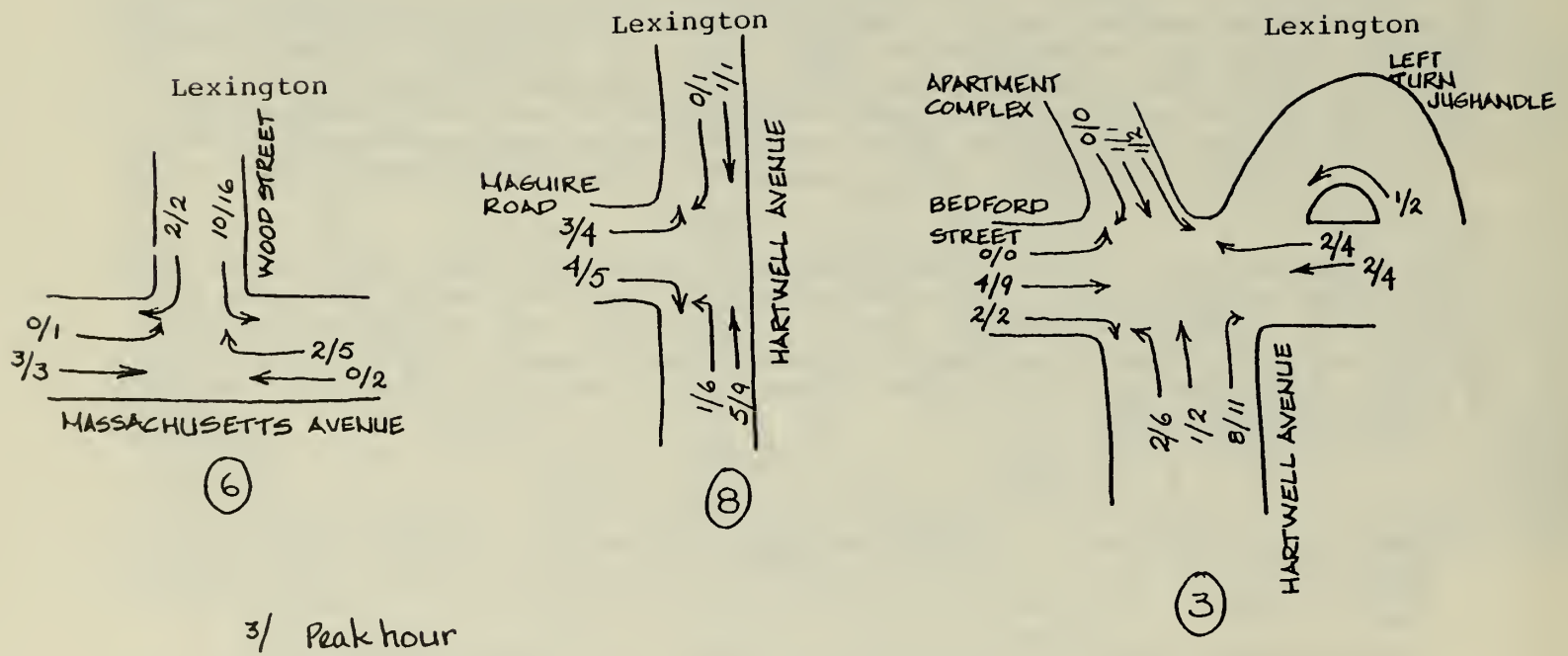
*The temperature at 10:30 a.m. was 50°F and at 6 p.m. 54°F, with the forecast being temperatures in the mid to high 60s, cloudy, with winds 10 to 20 mph. The temperatures were low for September in Boston.

**CTPS, Boston Area Bicycle Project, 1976, Appendix B, page 5.

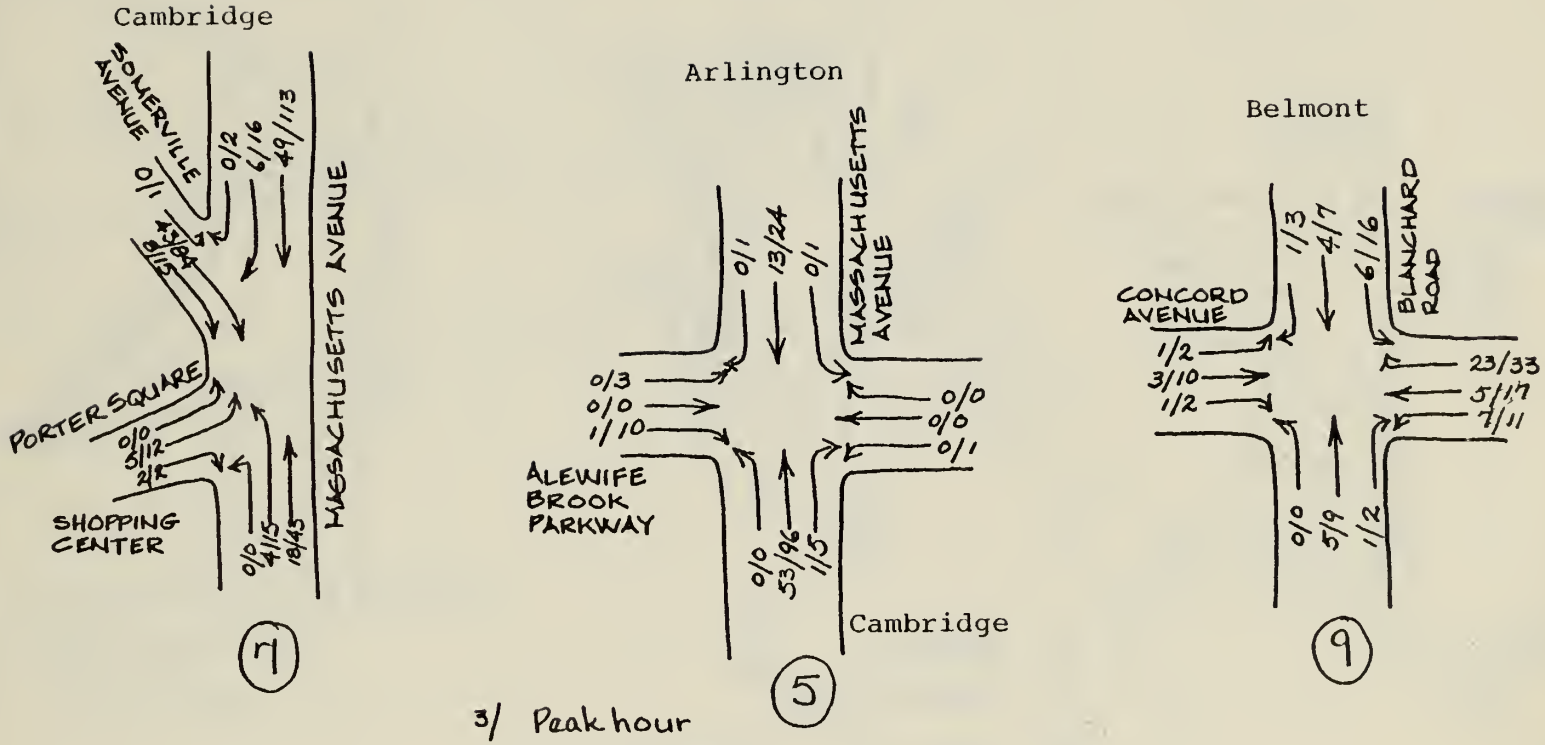
FIGURE 1
Bicycle Turning Movements



3/ Peak hour
/5 2½ hour total

(x) Refers to numbers on Map 5, page 34

FIGURE 2
Bicycle Turning Movements



3/ Peak hour

/5 2½ hour total

(X) Refers to numbers on Map 5, page 34

FIGURE 3
Bicycle Turning Movements

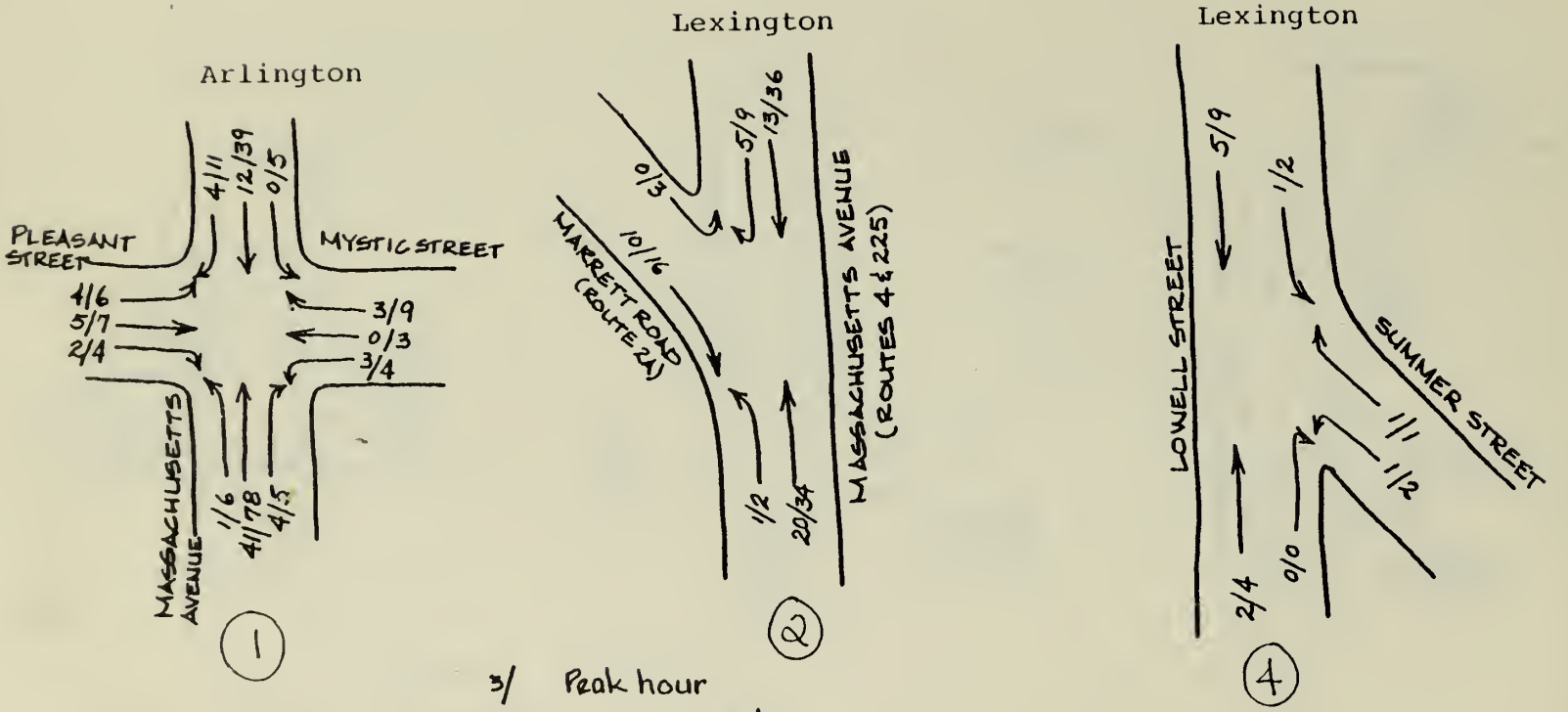
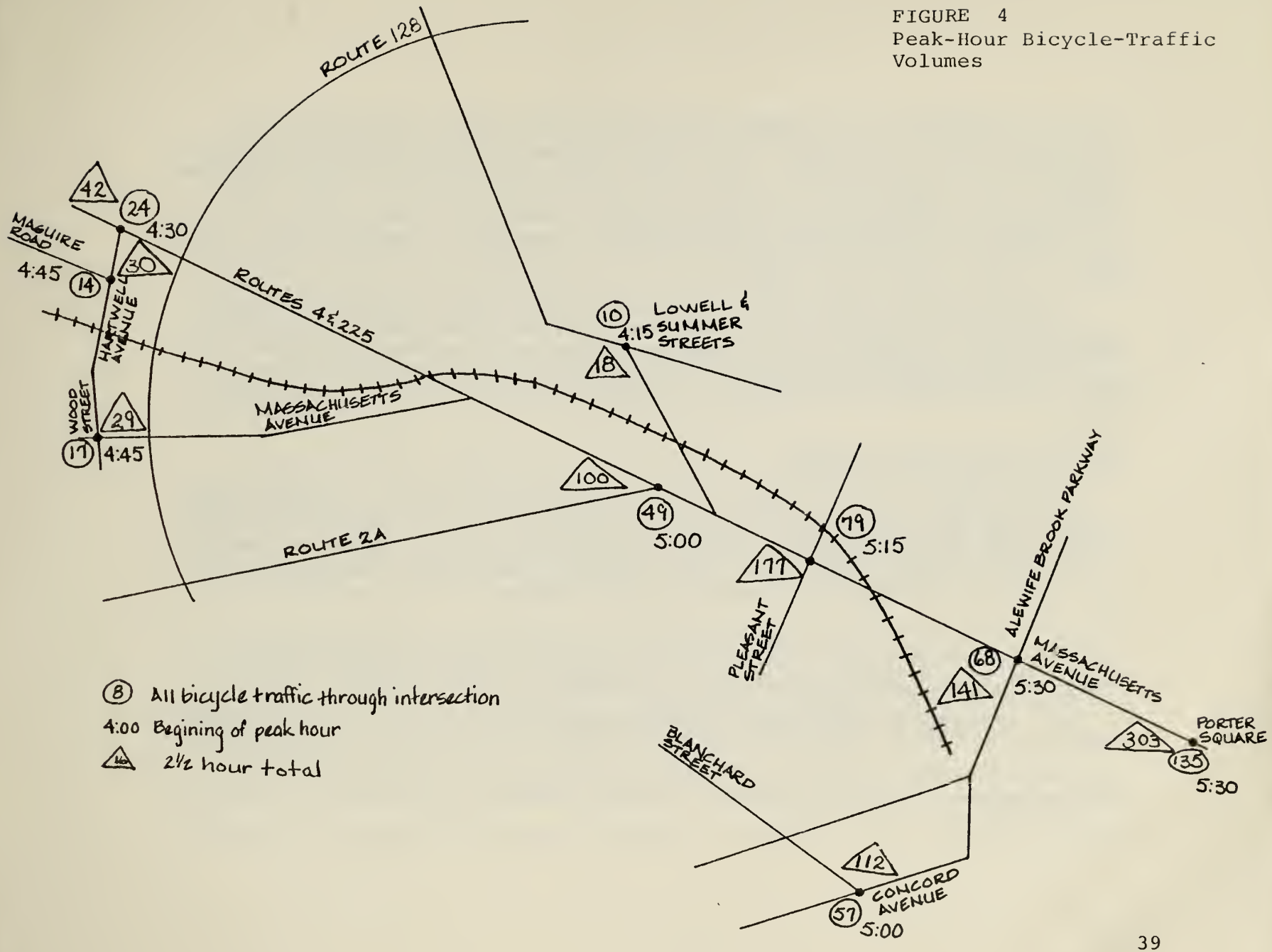


FIGURE 4
Peak-Hour Bicycle-Traffic Volumes



In a survey of 22 metropolitan areas nationally, the bicycle as the primary commuting mode varied from negligible to 3.2 percent, the average being 0.6 percent.* The 1975 census provided additional bicycle-use data for Cambridge, indicating that 6.4 percent of the work force bicycle to their jobs, and a 1970 survey in Bedford identified 0.2 percent of its work force as bicycle commuters.** According to CTPS counts, some one percent of those who commute to downtown Boston use the bicycle.***

As indicated, there are no tested methods for forecasting demand for bikeways. Bicycle-traffic volumes have not been collected before construction of bikeways and compared with actual volumes afterward. So translating existing volumes into future ones is guesswork. But since expected air-quality benefits are required of this study, projections follow.

Projected bicycle volumes

Those people who currently bicycle have made a series of decisions. First, they have seriously considered the bicycle as a mode of transportation. Next, they have decided that the risk of injury from automobile collision is sufficiently low. And finally, they have concluded that the bicycle is a convenient mode for their trips.

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*EPA, Bicycling and Air Quality Information Document, page 10.

**Town of Bedford, Open Space and Recreation Master Plan, 1977, page 237.

***Bicycle-traffic counts in 1975 and 1976 were compared with Boston Redevelopment Authority automobile cordon counts to develop this estimate.

To translate present use into future demand, it's necessary to make some assumptions about the number of people who have made these preceding decisions.

One of the major deterrents to bicycle use is the fear of collision with a car or truck. Surveys in Boston and in Gainesville, Florida, indicate that 53 and 73 percent of the surveyed populations (respectively) thought the danger of getting hit by a car to be very significant. Other surveys, in Madison, Wisconsin, and Tempe, Arizona, also found, not surprisingly, that such fear was the factor most inhibiting of bicycle use. From the Boston and Gainesville data, we can perhaps safely assume that 65 percent (roughly splitting the difference) of the Minute Man corridor population who might consider bicycling would also conclude that the risk of getting hit was too great to do so.

Other possible deterrents to bicycling include lack of secure parking, exposure to unexpectedly bad weather*, potholes, exhaust fumes, and attitudes toward bicycle commuting at the place of work. Without any studies on which to base an estimate, let us now propose, conservatively, that of those who seriously consider bicycling and also feel that it is sufficiently safe, perhaps three-quarters--75 percent--would use other modes of transportation anyway, for a variety of reasons.

Accepting these proposals, it is possible to proceed to an estimate of how many people overall in the corridor seriously consider bicycling at present. It has been observed that some one percent of the population already bicycle. Let X stand for the number of people overall in the Minute Man corridor who seriously consider bicycling at present. We have proposed that 65 percent of these people are too afraid of collisions

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*Exposure to expected inclement weather is included as a separate factor.

to bicycle, leaving 35 percent. Further, we proposed that 75 percent of those who aren't afraid of getting hit will nonetheless choose other means of transportation, leaving 25 percent of the 35 percent. Given that .25 times .35 time X equals one percent, then X, the number of people who seriously consider bicycling currently, is about 11 percent of the total population.

And the Minute Man Commuter Bikeway would increase both the visibility of bicycling and its perceived safety. Surely, more people would seriously consider bicycling because of the publicity about the new bikeway, and bicycling on it (and perhaps in general) would surely be perceived as sufficiently safe by a greater portion of the population.

How great? If it can be safely assumed that the population who seriously consider bicycling would triple (to 33 percent) after the bikeway is built, and if it can further be assumed that the number who would perceive the bikeway to be sufficiently safe doubles (to 70 percent) and that, as before, approximately 75 percent of these would find other modes preferable, then the post-bikeway result is an increase to six times the number of present bicyclists.

The reader is reminded at this point that while these estimates are based partly on data, the conclusions are primarily guesses. Actual demand for the bikeway cannot be known before it is built. Bicycle volumes will, of course, vary with the availability and price of alternative modes. During the New York City transit strike in April 1980, for example, bicycle volumes increased by 1500 percent. And after the strike, bicycle commuting remained 100 percent higher than before.* In contrast,

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*New York City DOT figures by L. Reilly, NYC Bicycle Coordinator, November 11, 1980.

bicycle-commuting volumes in Boston have increased almost 40 percent in the past five years.* While this increase is significant, it pales beside a 100-percent increase after an 11-day period. These data suggest mostly that it is the unavailability of other modes which will cause people to bicycle. Naturally, it is impossible to predict such occurrences of unavailability.

Some data are available on weekend use in the metropolitan area. One intersection that has been counted on weekends is Boylston Street at Memorial Drive, in Cambridge. The following table indicates volumes there on four days.

TABLE 4

Bicycle Volumes, Memorial Drive at Boylston Street, Cambridge

Date		Time	Total Volume
10-9-75	Thursday	5-6 p.m.	164
11-2-75	Sunday	3:15-4:15 p.m.	357
10-4-80	Saturday	4-5 p.m.	261
10-9-80	Thursday	5:15-6:15 p.m.	248

*Nine metropolitan intersections were counted on Thursday, October 9, 1975, and again on Thursday, October 9, 1980. Peak-hour counts increased an average of 39.6 percent.

In 1975, the Sunday volume was more than twice as large as the weekday count. In 1980, the Saturday volume was only slightly larger than the weekday count. On Sunday, May 16, 1976, 224 bicycles went through this intersection in only a 15-minute period, for an hourly rate of almost 1,000.

It is clear that weekend bicycle traffic surpasses weekday use. Let use postulate that Saturday use would be 50 percent higher than weekday use. Although the hourly volume in the preceding table is not significantly higher than weekday use, there is probably less peaking on Saturdays than on weekdays, that is, bicycle volumes are more constant throughout the hours on Saturday.

It seems that recreational users outnumber commuters and those making utility trips. Almost all Sunday bicycling is recreational, of course. It can probably be safely assumed that Sunday bicyle traffic is 100 percent higher than weekday traffic.

Going back to the counts of September 24, 1980, let us assume that all of the bicyclists counted would use the Minute Man Bikeway. (This is unlikely to happen, but such an assumption acts to balance out those cyclists who might use the bikeway yet were not counted because they did not go through the nine observed intersections.)

A simple way to compute 1980 peak-hour use of the bikeway would be to add the nine peak-hour counts and then substract a percentage of overlap. That is, a cyclist who went from Porter Square to Arlington Center could have been counted at three locations. The total peak-hour count was 453 bicycles. Assuming that some 20 percent of the total bicyclists were counted twice, 10 percent of these three times and five percent four or more times, the count of 453 can be reduced to approximately 300 bicyclists.

This peak-hour count must be converted to average daily traffic. An analysis done by CTPS in 1976 suggests that peak-hour bicycle traffic is approximately 10 percent of the daily traffic, so the 300 peak-hour bicycle trips can be interpreted as 3000 daily bicycle trips.

Now, if weekday trips are increased by the post-bikeway factor of six, then some 18,000 trips would be made daily. Most cyclists do not bicycle in bad weather, and for the Boston area, only 60 percent of the days are considered acceptable for the average cyclist.* The 18,000 daily bicycle trips, five days a week, multiplied by 50 weeks a year times 60 percent acceptable weather, totals 2,700,000 annual weekday trips.

With Saturday traffic estimated to be 50 percent higher than that of weekdays, and Sundays 100 percent higher, the annual weekend trips would equal 70 percent of the weekday trips, or a total of 1,890,000. The annual total for both weekdays and weekends would then be 4,590,000 trips.

Reduction in vehicle miles traveled

Naturally, only a portion of these almost five million annual bicycle trips would replace ones by car. A 1974 Pennsylvania survey indicated that 58 percent of the bicyclists statewide would have substituted an automobile trip for their bicycle trips: 33 percent as auto drivers and 25 percent as passengers.** And a 1974 survey in Washington, DC, found that of all commuting bicyclists, the alternative for 24 percent would have been driving, and another eight percent would have been passengers.***

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*CTPS, Boston Area Bicycle Project, 1976, p.50.

**EPA, Bicycling and Air Quality Information Document, September 1979, p.24

***Ibid.

In addition to all bicycle trips that substitute for auto-driver trips, let's assume that two-thirds of those for passengers replace car travel. If the Pennsylvania data are used, 50 percent of bicycle trips (33 percent plus two-thirds of 25 percent) replace those of cars. With the DC data, the replacement figure is 30 percent (24 percent plus two-thirds of eight percent). If we accept that the Bedford-to-Boston corridor is more similar to Washington, DC, than to the state of Pennsylvania, then it is reasonable that the Washington data should receive additional (we'll say double) weight. Therefore, it will be projected that 37 percent of the Minute Man bicycle trips will be substituted for those that would have been made by car.

This 37-percent factor should be applied to only 5/6 of the annual bicycle trips developed above, since one-sixth of those trips are made by current cyclists.

Finally, an estimate of the average distance of the vehicle trips displaced by the bikeway must be made. Some bicyclists commute 10 miles or more, but it is generally accepted that most bicyle trips (ones that aren't short) are five miles or less. To take an average of three miles, then, seems entirely reasonable. The average annual reduction in vehicle miles traveled by the bikeway thus could be 4,590,000 times 5/6 times .37 times three miles, or 4,245,750 miles.

And the future? Nine intersections in the metropolitan-Boston area were counted on the afternoon of Thursday, October 9, 1975, and again on Thursday, October 9, 1980. Even though little in the way of educational or publicity programs to increase bicycling has occurred and no major facilities have been built in the area, bicycling has increased substantially. The 1980 peak-hour counts at the nine intersections increased some 40 percent in those five years; the corresponding peak-period counts (generally 4 to 6 p.m.) increased an average of 33 percent.

Using the lower figure, an increase of around 33 percent in five years yields (compounded) an increase of almost 46 percent in seven years. The bikeway itself, however, would more quickly attract some of those who might have started bicycling anyway without it. So if only half of this increase occurred upon completion of the bikeway, then the 1987 reduction in vehicle miles traveled would still be some 23 percent higher than the 1980 figure, or 5.222 million miles.

Fuel savings

By designating an average value for miles per gallon (mpg), the above VMTs can be converted to fuel savings. Because new cars are more fuel-efficient, the average mpg is increasing every year. According to estimates by the Massachusetts Department of Environmental Quality Engineering, the average automobile mpg is 14.3 for 1980 and will be 20.5 for 1987.

Dividing the VMT reduced by the Minute Man Bikeway by the above averages yields the annual fuel savings, as shown.

TABLE 5

Projected Fuel Savings

Year	VMT (miles/year)	Average mpg	Annual fuel savings (gallons)
1980	4,245,750	14.3	297,000
1987	5,222,270	20.5	255,000

As has been emphasized throughout this section, almost all of these calculations are best guesses, often derived from worst cases. It is therefore especially important that bicycle counts and survey data be collected after construction to ascertain the bikeway's use and actual effect on air quality. Our preceding figures and calculations are intended primarily to convey the order of magnitude of that effect.

Effect of pollutants on bicyclists

Two of the five major air pollutants are closely linked to the automobile: carbon monoxide and ozone. The other three, sulfur dioxide, nitrogen dioxide, and total suspended particulates, are emitted primarily by stationary sources.

Carbon monoxide is a direct product of motor vehicles. CO has no odor or color. It interferes with oxygen supply. When we breathe, oxygen in the air enters the lungs, combines with the blood protein hemoglobin, and is carried into the bloodstream. When CO enters the lungs, it also links with hemoglobin, taking the place of needed oxygen. Indeed, the hemoglobin actually prefers bonding with CO to bonding with oxygen. Chemicals have certain "affinities" for each other; the affinity of hemoglobin for CO is 200 times its affinity for oxygen.

The intake of CO and the consequent oxygen depletion have these symptoms: slowness in reacting, dizziness, fatigue, redness, and headache. If enough CO is inhaled, the body does not have enough oxygen to survive. The presence of CO is particularly important to persons who exercise, because their intake of air is so much greater.

A Study of the Health Effects of Bicycling in an Urban Atmosphere, by the US Department of Transportation, compared the effects of pollution

on bicyclists and automobile drivers.* The subjects used a set of four routes with varying levels of pollution. Pulse, temperature, respiration, and carboxyhemoglobin levels in the blood were measured, both before and after exposure to the urban atomsphere. The main conclusion:

"Based upon this study of ten healthy male subjects, no major adverse short-term health effects were noted while bicycling or driving in levels of pollution and thermal stress encountered during the testing period."**

Another conclusion was that traffic slowdowns or intersection delays may create more significant negative health effects than traveling along urban routes. The mean carboxyhemoglobin levels for the motorists were 2.1 percent and were slightly lower for the bicyclists--1.7 percent. (A person who smokes one to two packs a day would have four to six percent.)

Photochemical oxidants, the most prevalent of which is ozone, are formed by a reaction of hydrocarbons (except methane) and nitrogen oxides in the presence of sunlight. The hydrocarbons and nitrogen oxides come from motor vehicles as well as stationary sources. The formation of ozone takes time, so its concentration is not as directly related to traffic volume and congestion as carbon monoxide's is. As a matter of fact, ozone concentrations can be higher in the suburbs downwind of a city than in the city itself.

Ozone and the other photochemical oxidants are respiratory irritants that can impair breathing by causing physiological changes in the lungs.

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*Published November 1977, no. DOT-TES-78-001.

**Ibid., p. 105

People with chronic respiratory diseases, such as asthma, bronchitis, and emphysema are most susceptible. The public may experience headaches, coughing, chest discomfort, and increased breathing rates when ozone levels are high, especially if exercise is vigorous.

Air-quality impact

The reduction in VMTs must be translated into its effect on air quality. This is done by using criteria developed by the EPA. These give grams per mile of pollutants and vary with the mix of the motor-vehicle fleet, the assumed average speed, and the average engine temperature.

In this case, it is assumed that all VMTs are by automobiles, not trucks. There are also different pollutant criteria for different years: new cars have lower emission rates, so 1980 pollutant criteria are higher than those for 1987.

It is further assumed that the average automobile speed is 30 mph. Given an average length of three miles, most trips would take place in local traffic and therefore at relatively low speeds. At such speeds, pollution equipment is less effective. Likewise, short trips are less efficient because engines do not reach their hottest state, resulting in higher fuel use and less control of pollution. It is assumed here that 60 percent of the substituted automobile trips would be "cold-start" ones. The average cold-start share is 20 percent of the total.

With these assumptions, then, for the year 1980, 5.07 grams of hydrocarbons (HC) are emitted per vehicle mile traveled. With the improvement expected in vehicular-pollution controls by 1987, this figure becomes 2.1. (As indicated, non-methane hydrocarbons, in the presence of sunlight and nitrogen oxides, create ozone. The ozone thus is formed some time after, and downwind of, the emission of hydrocarbons.)

Carbon monoxide comes directly out of tailpipes. CO "hot spots" consequently usually arise at intersections, where a large number of vehicles take a relatively long time to cover a short distance. The CO levels at specific intersections in the study area were not computed for this report. Another report suggested that two study-area intersections, Porter Square and Route 2 at Alewife Brook Parkway, would have high CO levels.* Grams of CO emitted per vehicle mile is 86.52 for 1980 and 35.95 for 1987.

The estimated impact of the Minute Man Bikeway on the emissions of these two pollutants may be derived by multiplying the grams-per-mile values by the VMT. The results follow.

TABLE 6

Projected Impact on Pollutant Emissions

Year	VMT (miles/year)	CO (tons/year)	HC (tons/year)
1980	4,245,750	405	24
1987	5,222,270	207	12

To have met federal air-quality standards by 1980, transportation-related HC emissions in the MAPC region would have to have been reduced by 56,385 tons. The corresponding figure for 1987 is 11,617 tons, assuming the existence of lower-emitting vehicles and inspection and maintenance programs. The estimated shares of these reductions provided by the Minute Man Bikeway are 0.04 percent for 1980 and 0.1 percent for 1987.

The effect of this single local project on a regional problem, therefore, is low. If Minute Man-type facilities were built throughout the 101 MAPC communities rather than through just four, naturally the impact would be greater. A crude estimate of that impact could be had by assuming the

*Actual carbon-monoxide levels weren't computed because these intersections are too complex for existing EPA computer software. This analysis is under way at CTPS by D. Athens.

relative impact of the Minute Man Bikeway to be a function of population. The study area's population is 200,000, or about 6.5 percent of the MAPC region's population of some 3,100,000. Similar bikeways throughout the area could account for 0.6 percent of the 1980 required hydrocarbon reductions and 1.5 percent of those for 1987.

Because carbon monoxide is a localized problem, data from intersections are required. These data are unavailable in the study area.

Separate from how much a bikeway may decrease CO levels is its general effect on health. Cyclists on the bikeway would be away from the street and therefore farther from the CO emitted by cars and trucks. It has been estimated that CO levels fall off 80 percent at 30 to 50 feet from the traffic stream.* And in addition to this sharply reduced exposure to carbon monoxide, cyclists would get virtually none of the noise and smells of the internal-combustion engine.

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*R.S. Brief et al., "Lead, Carbon Monoxide and Traffic: A Correlation Study," Journal of the Air Pollution Control Association, 1960, pp. 384-388.

RECOMMENDATIONS

Overview

Because uninterrupted corridors of land are scarce, particularly in metropolitan areas, bicycle paths are difficult to build. This MBTA Lexington Branch right-of-way provides a unique opportunity. If, as indicated, multiple use of the corridor is a good idea, then a bikeway properly implemented could complement existing and proposed transportation systems in this corridor. The recommendations have been formulated to provide reasonable solutions to any conflicts.

Construction recommendations

There are other uses, such as walking and jogging, that may be compatible with a bikeway and should be considered in making the recommendations for construction of the Minute Man Commuter Bikeway.

1) Construct Minute Man Commuter Bikeway with a pavement width of 12 feet to accommodate compatible uses. Paving materials similar to those used in roadway construction should be employed. See figure 5.

2) Develop a lease between the communities and the MBTA for use of the Lexington Branch Right-of-Way for a specified period (25 to 30 years). This lease could stipulate replacement of the bikeway if feasible, subsequent to any further construction of the MBTA Red Line extension.

3) Develop bikeway access at grade-level crossings and otherwise where feasible, e.g., through adjacent parking lots and/or publicly owned property, as shown in figure 6.

4) Install lights along bikeway in areas where the safety of the cyclists might be improved. See figure 7.

5) Install safety barriers at above-grade locations where right-of-way crosses over roadways, as shown in figure 8.

6) Install safety railings at locations where the right-of-way crosses streams, as shown in figure 9.

7) Plant for erosion control on slopes where such landscape treatment is appropriate. See figure 10.

8) Stabilize other slopes where feasible, by making use of existing materials such as rails and/or ties. See figure 11.

9) Integrate the proposed bikeway with existing traffic-flow patterns at the Arlington Center (Route 60/Massachusetts Avenue) intersection by installing appropriate signs and pavement markings, as shown in figure 12.

10) Install warning signs and pavement markings along the bikeway and intersecting roadways to alert both cyclists and motorists to the proximity of an intersection and in other areas where cyclist safety might be enhanced. See figures 13, 14, and 15.

The cost of the proposed Minute Man Commuter Bikeway, if constructed in the manner prescribed, would be an estimated $138,200 per mile, or $1,520,200 for the 11-mile system. However, because the construction of the proposed MDC sewer line through Lexington could require the removal of railroad tracks and ties, the per-mile cost in that community could be reduced to $98,200. This would mean a reduction in the overall cost and would reduce the final estimate to $1,300,200.

Implementation recommendations

Before an application for construction funding is prepared, a determination on the freight service will be needed. The following recommendations concern the decision regarding permanent abandonment of the Boston and Maine freight service.

1) MAPC should present appropriate evidence of local support for the proposed Minute Man Commuter Bikeway to the US District Court in coordination and cooperation with the MBTA and the Trustees of the Boston and Maine Railroad. But given the feasibility of joint use, the court decision is of less importance. Therefore, MAPC and CTPS should prepare an application for funding, with the appropriate input from the Minute Man Bikeway Working Committee and with the cooperation of the MBTA and the MDPW. This should take place within a reasonable period, to allow for public reaction. The application then should be submitted to the MDPW, whose Bikeway Bond Program enables 100-percent funding of regional bikeways.

Maintenance recommendation

Adequate maintenance of the proposed facility is essential. Because there is no current state or federal program to cover the cost of bikeway maintenance, it is recommended that the following methods and/or programs be adopted.

1) A Memorandum of Understanding (MOU) should be negotiated among the communities of Cambridge, Arlington, Lexington, and Bedford that would specify the type and level of maintenance to be provided for the length of the proposed

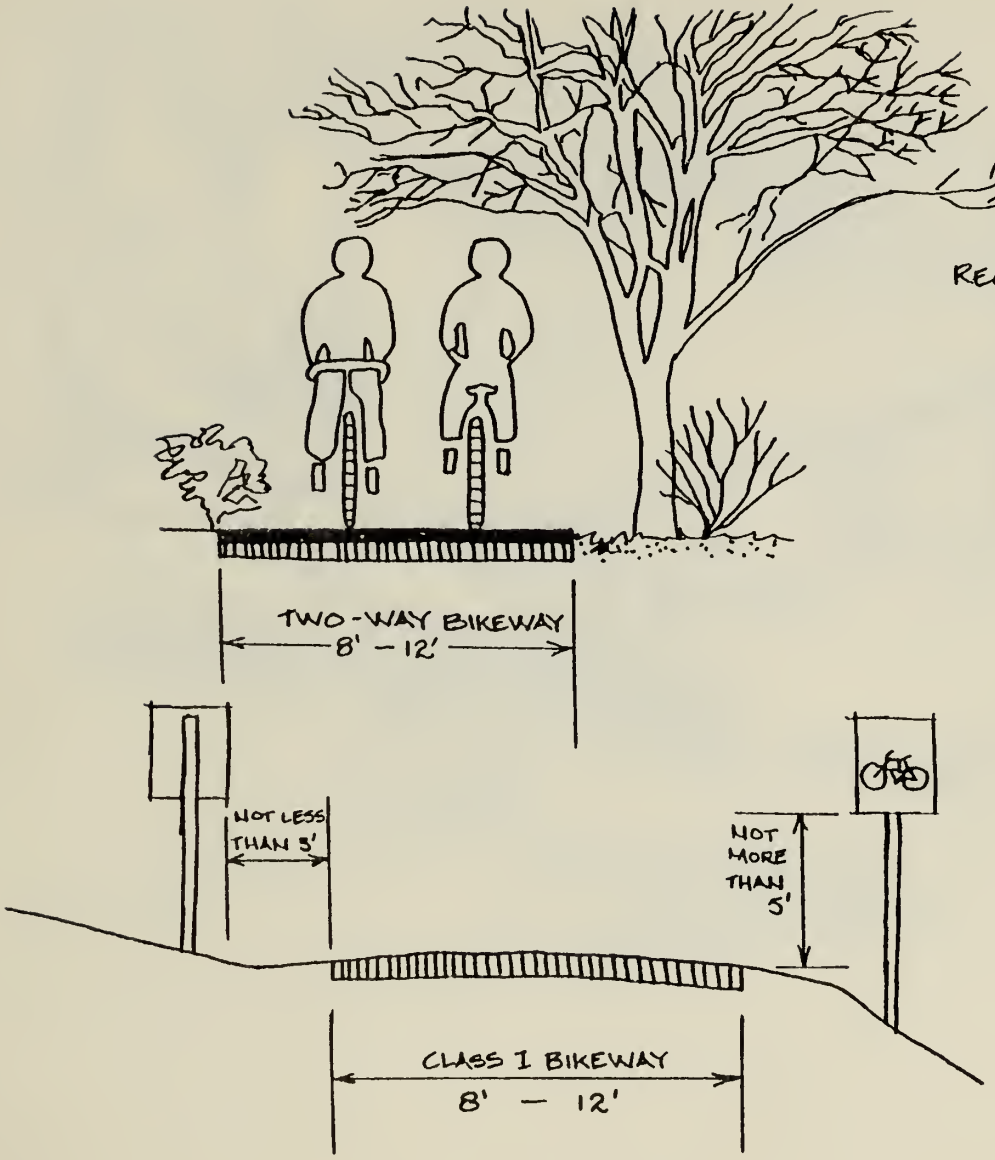
bikeway. The MOU would contain schedules and standards to which each community should commit itself. Maintenance should include sweeping; pavement, sign, and light repairs; trimming and clearing of brush as necessary; and winter plowing. Maintenance costs should be allocated per mile of bikeway within the community based upon the following: .5 miles in Cambridge
4.0 miles in Arlington
5.5 miles in Lexington
1.0 miles in Bedford.
MAPC should coordinate the efforts and seek the participation of the MDPW and the MBTA to ensure a sustained and coordinated effort as well as to arbitrate any conflicts that might arise. The agreement could also contain a provision that the prohibition against use of the bikeway by motorcycles should be enforced by the local police departments.

Joint-use recommendation

If the freight service resumes operation after the MBTA construction of the station and garage complex at Alewife, it should not preclude construction of the proposed bikeway. Bikeway construction for the three-and-a-half-mile portion of the right-of-way used by the freight trains could be handled by installing a safety barrier to separate the uses and by constructing the bikeway alongside the existing tracks.

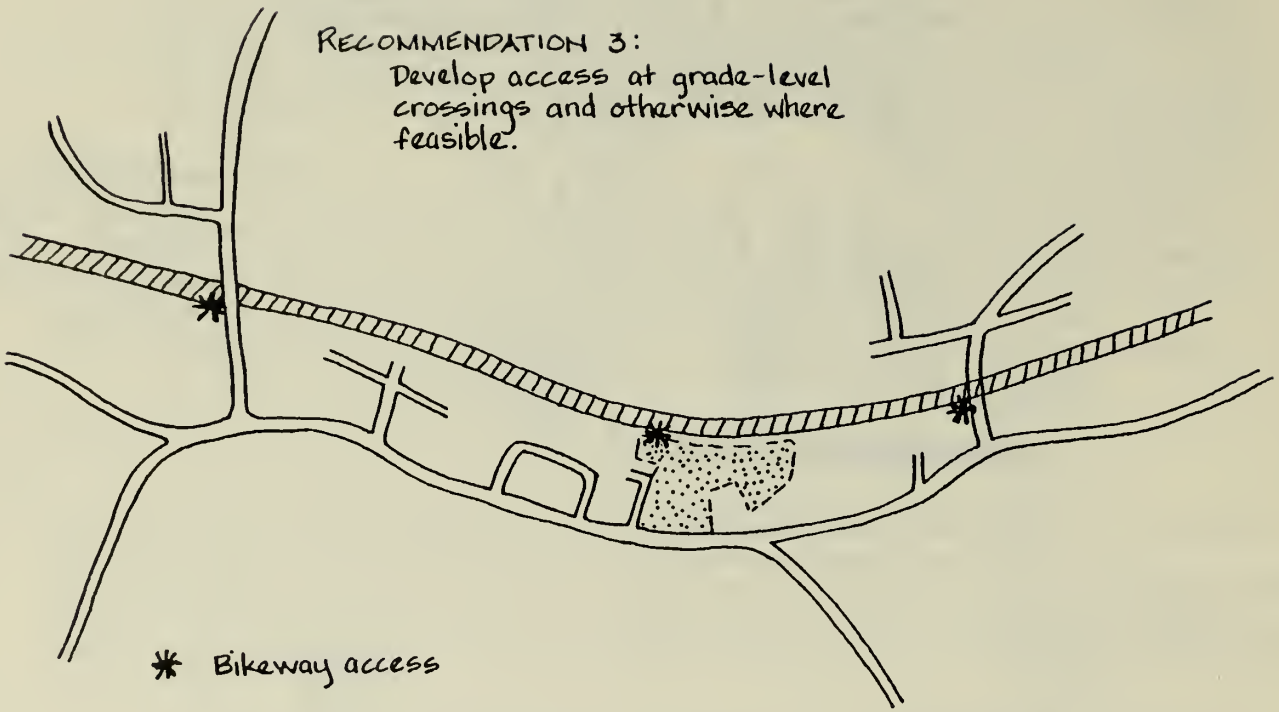
1) Construct the 3.5-mile portion of the Minute Man Commuter Bikeway from Alewife to Arlington Heights in a manner that will accommodate the right-of-way's use both by trains and by bicycles. See figure 16.

FIGURE 5
Bikeway Width



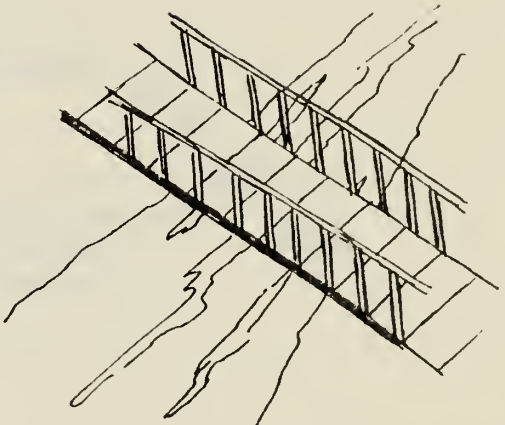
RECOMMENDATION 1:
Construct bikeway to a 12' width with pavement similar to those used for roadways.

FIGURE 6
Bikeway Access

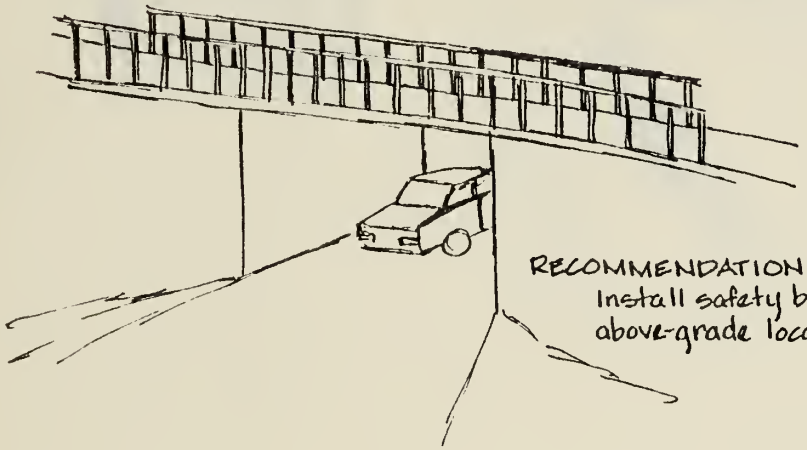


FIGURES 7, 8, & 9
Safety Recommendations

RECOMMENDATION 4:
Install lights in areas where safety of cyclists might be improved.

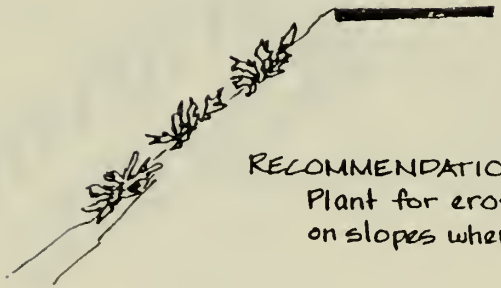


RECOMMENDATION 6:
Install safety railings where bikeway crosses streams.



RECOMMENDATION 5:
Install safety barrier at above-grade locations.

FIGURES 10 & 11
Slope Treatment



RECOMMENDATION 7:
Plant for erosion control on slopes where appropriate.

RECOMMENDATION 8:
Stabilize other slopes by using rails and/or ties where feasible.

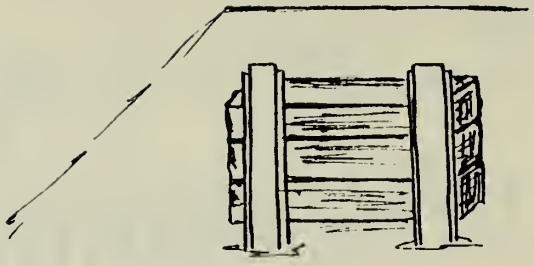
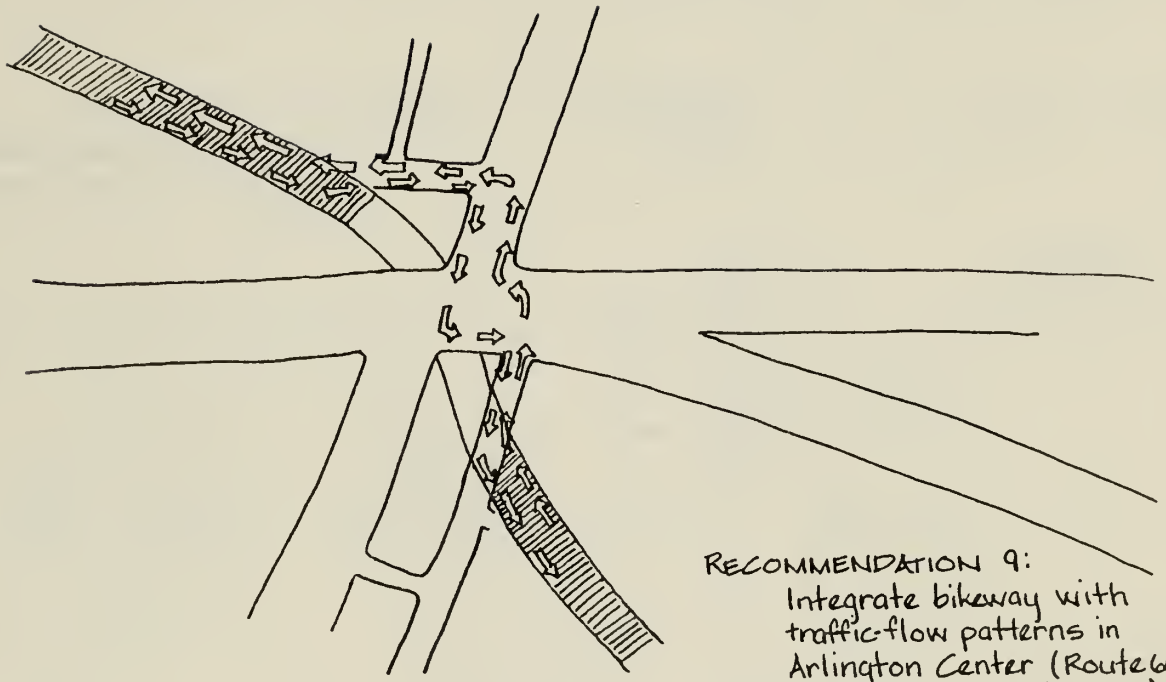
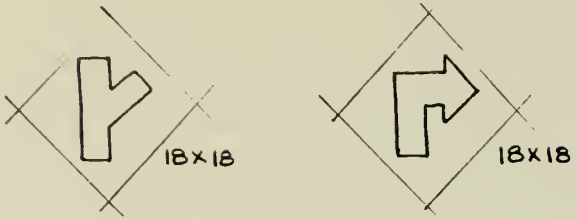


FIGURE 12
Proposed Treatment of
Arlington Center Intersection

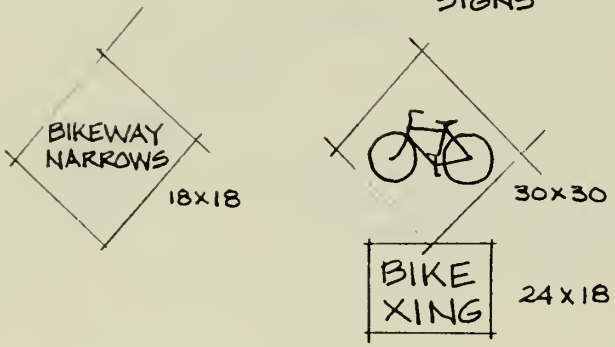


RECOMMENDATION 9:
Integrate bikeway with traffic-flow patterns in Arlington Center (Route 60/ Massachusetts Avenue)

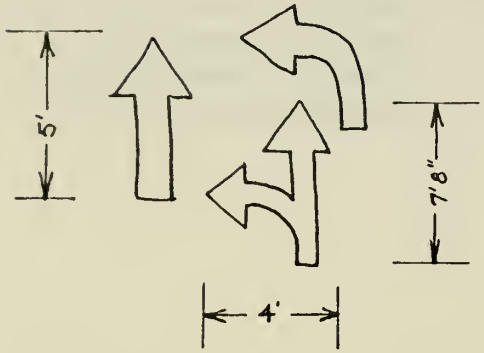
FIGURES 13 & 14
Warning Signs and Pavement Markings



WARNING SIGNS



RECOMMENDATION 10:
Install warning signs and pavement markings along bikeway.



PAVEMENT MARKINGS

FIGURE 15
Intersection Warning Signs

RECOMMENDATION 10:

Install warning signs along bikeway and intersecting roadways to alert both cyclists and motorists to the proximity of an intersection.

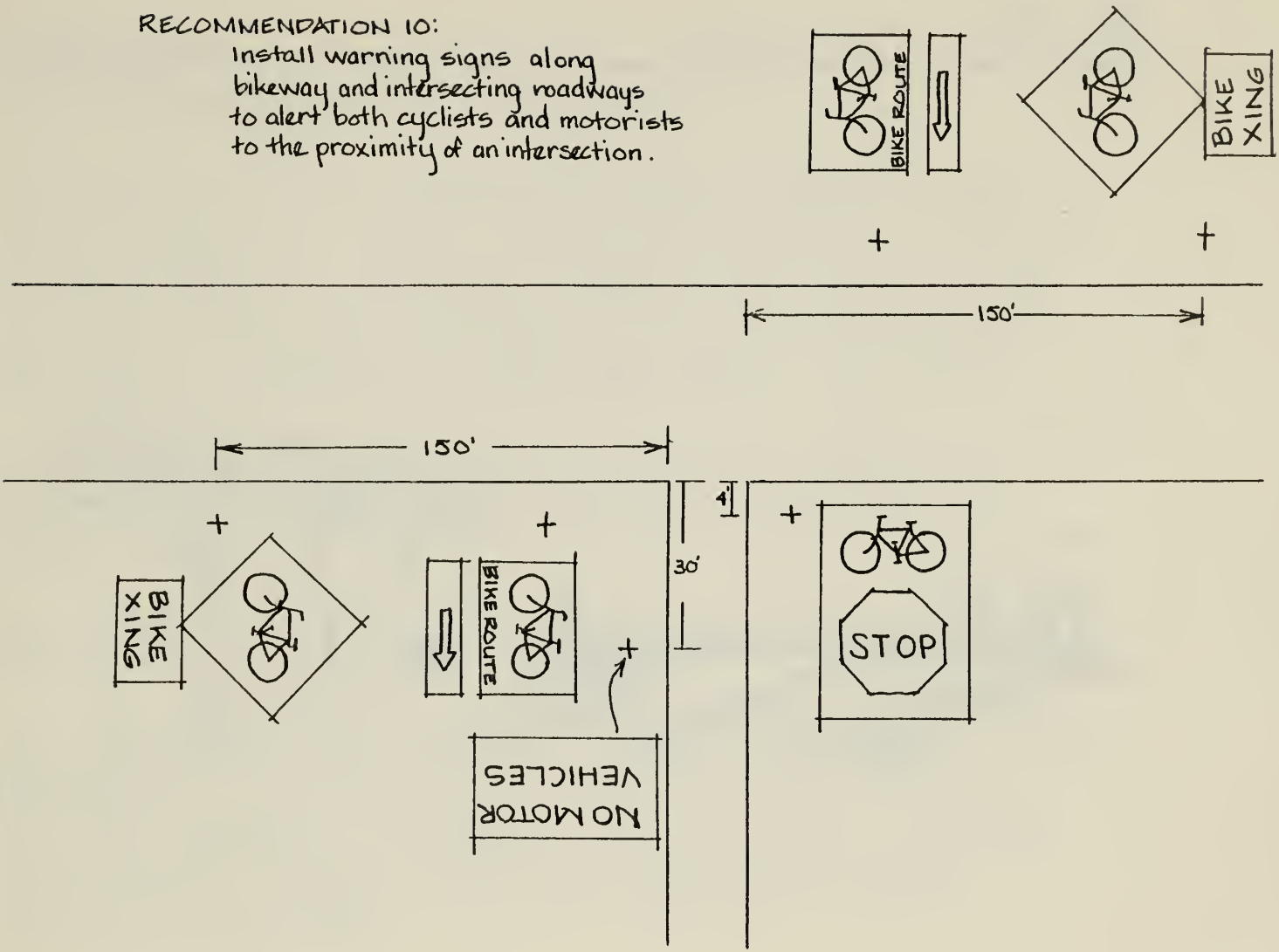


FIGURE 16
Joint Use of Right-of-Way

APPENDIX

The Massachusetts Department of Public Works
Bikeway Bond Program

In 1975 the Massachusetts Legislature and Governor, authorized a Transportation Bond issue which included one million dollars for bicycle facilities. In 1977 the Transportation Bond issue included two million dollars earmarked for bicycle facilities. These funds are to be spent on a 75% state, 25% local basis. In-kind services including design, preliminary engineering, and construction may be accepted as part of the 25% local share at the discretion of the Massachusetts Department of Public Works (MDPW). (The MDPW has been very open to accepting in-kind services.)

To receive MDPW funding, a proposal must be submitted to the Regional Planning Agency. For the Metropolitan Area Planning Council (MAPC) region, technical assistance for, and review of, bicycle proposals is provided by the Central Transportation Planning Staff (CTPS).

The proposal should present the plan and reasons for submitting it as concisely as possible. A map should be included indicating the suggested facilities.

The argument should be made as to why the proposed facilities are most important. That is, what do the proposed facilities provide access to, and are they conveniently located so that residents and visitors will use them? Also, explain why other alternatives have been discarded. For example, if a bicycle path is proposed along a major arterial, the alternative of diverting bicycles to less-traveled residential streets was discarded for reasons which should be documented, (i.e., the residential streets are too far out of the way).

The location of reported bicycle accidents (available from local police) over the last five years should be documented. This analysis will help ensure that the most hazardous locations are either being improved or bypassed. In some communities, the accidents are so few that no patterns develop.

To ensure that the proposal has local official support, and to eliminate the possibility of more than one plan being submitted from a community, the group developing the proposal should receive early sanction from the highest elected local officials (i.e., mayor, board of selectmen). The proposal should also be reviewed by relevant groups such as the planning board, police, school, recreation, public works and traffic departments, and conservation commission. A publicized meeting should be held so that all citizens have an opportunity to review the proposal.

Process of Review and Recommendation

Community submits three(3) copies of proposal to regional planning agency (CTPS for the Metropolitan Planning Area Council(MAPC)).
CTPS forwards two copies to the Mass. DPW, one to the District Highway Engineer and one to the Bureau of Transportation Planning and Development(BTP&D).
CTPS and the District MDPW office make recommendations to the BTP&D. BTP&D then recommends action to the Mass. DPW's Project Review Committee, which decides all allocations.

INTRODUCTION

Based on our experience with the "1975 Bikeway Bond Issue Program," an evaluation was made of the current Bikeway Planning Processes and procedures. The following "1977 Bikeway Bond Issue Program Guidelines" have been developed to expedite the implementation of bikeway projects throughout the state.

The objective of the "1977 Program" is to implement bikeway proposals as soon as possible. It is the Department's objective to insure equitable geographic distribution of available funds statewide. However high priority will be given to specific proposals which can be implemented shortly after selections are made by the Department. Communities with large and complicated proposals are urged to concentrate on the planning and development of projects which can be designed and built in smaller usable segments. As future funds become available additional projects can then be completed. With Department approval, communities can begin designing the projects at their own expense with the understanding that the costs will be credited toward the local share of 25% of total project costs; preliminary engineering, right of way purchase, and construction, if the project is selected for funding.

Following is a summary of the program and implementating procedures:

I. Authority - Chapter 356-Acts of 1977

A. Section 2 (c) - Two million dollar authorization.

B. Section 12 - Chapter 90E - Bikeways.

1. 75% State share - 25% local share for bikeway projects.

2. 50% State share - 50% local share for bicycle parking facilities adjacent to mass transit facilities.

II. Planning Process and Procedures.

A. Community Level.

1. In order to avoid duplication and conflict, a single municipal agency should be designated by chief elected officials to have the responsibility of representing the community in bikeway planning and implementation.

2. The Regional Planning Agency (RPA) should be the primary source of providing planning assistance to communities.

3. Bikeway planning should be conducted in accordance with the established State-Regional-Local comprehensive, cooperative and continuing "3C" Transportation Planning Process.

4. Communities should develop a funding scheme for the 25% local match of cash or in-kind services.

a. The communities are to provide adequate documentation for the value of in-kind services.

b. The Department of Public Works will be the final judge of the value of non-cash contributions.
c. Local communities will maintain and police finished project.

5. Communities shall submit Bikeway Proposals to the Regional Planning Agency with a cover letter from the Mayor or Board of Selectmen indicating support for the project. The RPA should forward copies of all proposals to the appropriate DPW District Highway Engineer promptly for review and comment. The route should be approved by the local police for safety purposes. It should all be on public ways or with required easements and, if necessary permits.

B. Regional Planning Agency Level.

1. Assist communities in development of bikeway master plans and proposals.

2. Develop a regional bikeway master plan, including priorities.

3. Review submitted proposals.

a. Determine if compatible with Regional Plan.
b. Coordinate with DPW District Office.
c. Determine regional project priority.

d. Forward recommended projects to Bureau of Transportation Planning and Development (BTP&D) and to the appropriate District Highway Engineer for review and comment and evaluation.

C. Department of Public Works

1. The District Highway Engineer will review project proposals and check:

   a. Cost estimates
   b. Location layout (for necessary permits, public ways, and etc).

   c. Determine design requirements: cross sections, pavement markings, signs, necessary specifications and special provisions.

2. Bureau of Transportation Planning and Development will evaluate proposals according to the following priorities with the assistance of the indicated agency:

   a. Hazardous location improvement on existing bikeway. (District)
   b. Existing demand or potential use (RPA)
   c. Continuity of bikeway plan (RPA)
   d. Community responsiveness (RPA)
   e. Timely implementation (District)
   f. Availability of local funding for immediate implementation (RPA).

g. Priority
   (1) local (Community)
   (2) Regional (RPA)
h. Function
   (1) Recreation (RPA)
   (2) Commuting (RPA)
i. Integration with other modes of transportation (RPA)
j. Compatability with needs of the Commonwealth (District

3. The District Highway Engineer recommends project for funding to the BTP&D.

4. The BTP&D reviews DHE and RPA recommendations:

   a. Develops tentative statewide allocation recommendation
   b. Forwards recommendations to Project Review Committee.

5. The Project Review Committee: Makes project selections.

III. Implementation - State Aid

A. State Aid administers implementation program.

B. Drafts a Memorandum of Agreement (MA) or Utility Agreement. In either situation, residual funds revert back to the Department for reallocation to other bikeway projects. (Preference for Department to be party of the first part).

C. Agreement signed between Department and Community to implement project.

BIKEWAY PROPOSAL CHECKLIST

Reference: 1977 Bikeway Bond Issue Program Guidelines

_____ Cover letter to RPA Director from the Mayor or Board of Selectmen indicating support of project.

_____ Designation of a single municipal agency (or individual) to have the responsibility of representing the community in bikeway planning and implementation.

_____ The approval of the proposed route by the local Police Department

_____ Funding scheme for the 25% local contribution.

_____ Understanding that Policing and Maintenance of finished project is the responsibility of the community.

_____ Right of Way on a Public Way or the acquirement of the required easements and, if necessary, permits.

_____ Map indicating proposed route with lengths and types of bikeways... Location of signs (their sizes and types). Typical section (s), Any pavement markings (sizes, type, legend).

_____ Description of proposed route and scope of project, estimate of quantities and costs.

_____ Proposed party to do the design.

_____ Proposed method of implementation (advertised contract, force account, or other).

_____ Original and three copies of proposal, forwarded to the Regional Planning Agency.

DEPARTMENT OF TRANSPORTATION

Federal-Aid Highway Program

Each year, the Federal Highway Administration (FHWA) apportions Federal-aid highway funds to the states for the planning, construction and improvement of Federal-aid highway facilities. Under the Federal-aid Highway Act of 1976 (P.L. 94-280) bicycle and pedestrian facilities may be built as incidental features of Federal-aid highways concurrent with highway construction.

In addition, under section 134 of the 1976 Highway Act, States are authorized to spend up to $2.5 million of the Federal-aid highway apportionment each year for bicycle facilities independent of other highway construction projects (up to $45 million nationwide). Facilities can be located on separate rights-of-way; however, they must serve bicycle traffic which would otherwise use a Federal-aid highway route. To receive approval, facilities must not impair motorist, bicyclist or pedestrian safety, must form part of an existing or planned bikeway system, be maintained by a public agency, have sufficient use in relation to its cost, and prohibit the use of motorized vehicles in the right-of way.

A brochure entitled *Bicycle and Pedestrian Facilities in the Federal Aid Highway Program*, is available upon request from the Office of Highway Planning. HHP-26, Federal Highway Administration, U.S. Department of Transportation, Washington, D.C. 20590.

Transportation Improvement Program

Under joint FHWA/UMTA regulations issued September 17, 1975 (Federal Register, Vol. 40, p. 42976), each designated Metropolitan Planning Organization (MPO) in urbanized areas with a population of 50,000 or more is required to develop, on a continuing basis, a Unified Planning Work Program describing anticipated planning needs. Federal funds allocated to MPO's for this purpose may be used for the planning and research activities necessary for the development and implementation of bicycle projects.

Planning needs are further defined in the Transportation Improvement Program (TIP) developed each year by the MPO. The TIP identifies projects that are expected to be constructed in the following year. Annual elements of the TIP can include incidental and/or separate bikeway facilities. The content of the TIP is affected considerably by the state highway agency, which determines the amount of the State matching share (20% of total planning funds), and which interprets the regulations.

One component of the Transportation Improvement Program is Transportation Systems Management (TSM). TSM directs localities to consider service oriented, relatively low-cost measures to increase the capacity and efficiency of existing highway facilities. Bicycle facilities may be important to the success of a TSM plan, although in some cases, the strategies recommended to facilitate traffic movement are not compatible with increased bicycle use.

The TIP and TSM requirements in the Federally-assisted transportation planning process have, in recent years, increased opportunities for local participation and shifted the point of emphasis for transportation planning from State transportation agencies to the MPO's and local agencies. In cities with populations under 50,000, however, TIP and TSM requirements do not apply. The city transportation official may be the best source of knowledge of planning funds, rather than a State or Federal agency. Where State bicycle coordinators have been designated, they would be valuable sources of information about FHWA and UMTA-assisted bicycle planning efforts.

Highway Safety Program

Under the authority of section 402 of the Highway Safety Act of 1966 (P.L. 89-564) the States were given $126 million in FY 1978 for the development of highway safety programs which may include bicycle accident studies, media spots, films, manuals, workshops, and staffing (such as city or state bi-

cycle coordinators).* The program is administerd by the National Highway Traffic Safety Administration.

In each State, the Governor's Representative for Highway Safety sets funding priorities for that State's annual apportionment, which is determined by population and highway mileage. Programs are funded with a Federal share of 70% for three years, after which time the program expires or is adopted by the State.

One of the most successful users of 402 funds is North Carolina, which has received over $400,000 in several years for a tremendous range of bicycle activities, including the hiring of a bikeway design specialist to assist localities in constructing and evaluating projects.** The North Carolina program has helped to develop media services, a state-wide bicycle registration/usage survey, handbooks, courses, and ten workshops on enforcement, design and citizen participation. North Carolina has the advantage of a supportive State Department of Transportation, which may be essential in most states to attract the attention of the Governor's Representative.

Communities interested in using the 402 program to develop bicycle safety programs should contact their Governor's Representative. Applicants should be prepared to back up proposals with a strong information base (i.e. local accident statistics) and the support of local police and education officials. A list of the Governor's Representatives may be obtained from the Office of Management Services, Division of General Services, NAD-42, National Highway Traffic Safety Administration, U.S. Department of Transportation, Washington, D.C., 20590.

*See "402 Funding for Bicycle Safety," *Bicycle Forum* No. 1, Spring 1978.

**See "A Conversation with the Captain," *Bicycle Forum* No. 1, Spring 1978.

DEPARTMENT OF THE INTERIOR

Land and Water Conservation Fund Program

The Department of the Interior's Heritage Conservation and Recreation Service (HCRS), formerly the Bureau of Outdoor Recreation, will allocate $750 million in FY 1979, and up to $900 million in FY 1980 to 1989, in grants to Federal, State and local governments for the acquisition and development of recreation facilities, including bikeways. These funds, authorized by the Land and Water Conservation Fund Act of 1965 (P.L. 88-578), are distributed to the States on a formula basis to the State Liaison Officer, who submits a Statewide Comprehensive Outdoor Recreation Plan (SCORP) to HCRS for approval.

Bikeways must be included in the statewide plan under the National Trails System Act of 1968, P.L. 90-543. The amounts of grants for bikeway development varies according to priorities set by the State Liaison Officer; the Federal share ranges from 40% to 50%, with the remainder contributed by State and local governments. Projects must be for public use (although they may be built on public or private land), primarily recreational in nature, and include an agreement to maintain the bikeway for such use for 25 years. Grants have also been awarded for the development of statewide bikeway plan elements for the SCORP

An important element of this program is the availability of technical assistance from HCRS staff in the preparation of grant applications and on the design of specific projects. By working with local planning agencies and their consultants, HCRS hopes to improve local expertise and encourage participation in other bikeway projects.

The HCRS has assisted in the development of some outstanding bikeway projects under this program. A 2½ mile trail in Greenville, South Carolina (initiated by the local Chamber of Commerce) connects the downtown area with three city parks along a stream valley. Extensive local participation was elicited to ensure creation of a high quality facility separate from city streets. The city supplied half the total project cost of $225,000.

Land and Water Conservation Funds need not be used for purely recreational facilities. With careful planning, the program can support valuable multi-purpose facilities. In Knoxville, LWC funds were matched

by State funds (for a total of $140,000) to construct the 1¾ mile long Third Creek Bike Trail, connecting a married students' housing complex with the University of Tennessee and used daily by hundreds of commuting cyclists, recreational bikers and joggers. As in Greenville, local participation was extensive. The East Tennessee Heart Association (now the East Tennessee Chapter, American Heart Association) initiated the project and solicited the donation of large tracts of property from private owners. The Knoxville Community Development Corporation designed and built the trail (with HCRS technical assistance). The Tennessee Department of Conservation provided matching funds, and the City Recreation Department assumed responsibility for maintenance.

An unusual use of the funds — and an important precedent for future projects — was the construction of a velodrome (bicycle racing track) in the Atlanta suburb of East Point. The velodrome was completed in 1975 at a cost of $200,000 (shared with the State). Staff of HCRS were instrumental in arranging the funding to complete the velodrome, which had been planned in that area for some time. Initial concern that the facility would lie unused proved unfounded. The complex, which includes a 330-meter bicycle track, jogging track, concession building with lockers and bleacher seating for 1500, is heavily used by sports enthusiasts of all ages.

Land and Water Conservation Funds have an advantage over some other types of Federal funding in their applicability to a variety of facility types and the opportunity for extensive local participation. Communities interested in obtaining HCRS assistance in planning recreational bikeways and developing project proposals may obtain an application package from the State Liaison Officer, who will subsequently review the proposals for consistency with the SCORP.

For a list of State Liaison Officers, program brochures and other general information, contact: Mr. Ted Davis, Outdoor Recreation Planner, Heritage Conservation and Recreation Service, Northeast Regional Office, 600 Arch Street, Philadelphia, PA 19106 (215 597-7391). A number of additional publications are available from the Southeast Regional Office, which has had considerable experience in bicycle facility planning. Contact: Dr. James J. Berryhill, Heritage Conservation and Recreation Service, Southeast Regional Office, 148 International Blvd., Atlanta, GA 30303 (404/221-4538).

Historic Preservation Funds

Under the authority of the Historic Preservation Act of 1966 (P.L. 89-665) the HCRS is responsible for the preservation of nationally significant historic and cultural sites. In FY 1978, $45 million was distributed to States on a formula basis for this purpose. At the discretion of the State Historic Preservation Officer (SHPO), these funds, which require a 50% matching share, may be used for the development of bicycle trails on National Register historic properties such as canals, bridges and battle grounds. This source of funds, to date, has rarely been used for bicycle facilities. In one instance, a bridge in Grand Rapids, Michigan, was converted to a bicycle-only facility using historic preservation funds.

Communities having National Register properties which may be suitable for the development of bike trails should contact their SHPO for information on possible funding sources. Brochures describing the historic preservation program and a list of SHPO's may be obtained by writing the Office of Archaeology and Historic Preservation, National Register Division, Heritage Conservation and Recreation Service, U.S. Department of the Interior, Washington, D.C. 20240.

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

Community Development and Block Grant Program

The Housing and Community Development Act of 1974 (P.L. 93-383) established in the Department of Housing and Urban Development (HUD) a major program to aid cities in improving low- and moderate-income areas. With $3.75 billion available in FY 1979, the Community Development Block Grant (CDBG) program affords substantial opportunities for localities to pro-

mote rational land use and better arrangements of residential, commercial and recreational facilities.

Under this program, which funnels 80% of its funds into metropolitan areas, funds are apportioned on the basis of population, extent of poverty and housing needs. Cities develop priorities for funding in short- and long-term plans addressing the needs of the poor, particularly in the area of housing. An essential element of the CDBG program is citizen participation, a formal plan for which is required under 1977 Amendments to the Housing Act. Proposals must also undergo "A-95" review by local and regional agencies for consistency with areawide plans, and must conform with State and Federal Environmental laws.

Bicycle facilities may be constructed with CDBG funds under section 105(1) and (2) of the Act, which include as eligible activities acquisition of real property "appropriate for the . . . conservation of open space, natural resources and scenic areas, (and) the provision of recreational opportunities," and "the acquisition, construction, reconstruction or installation of. . . recreation facilities." CDBG money can be used for both planning and construction of such facilities.

Applications endorsed by local governments go to the appropriate HUD area office, where they are reviewed within 45 days for legality, consistency with State planning, and adequacy of the citizen participation plan. The program includes an evaluation of completed projects' effectiveness by HUD area staff.

To date, the CDBG program has not been widely applied to the development of bicycle facilities, although such facilities are certainly eligible for funding. One very successful use of CDBG money for bikeways was in Southfield, Michigan, where four bikeways were constructed connecting various low-income residential areas to schools, commercial areas and recreation centers, benefitting both bikeway users and area businessmen.

A brochure describing the CBDG Program can be obtained from the Consumer Protection Information Center, U.S. Department of Housing and Urban Development, Washington, D.C., 20410 (202) 755-6240.

ENVIRONMENTAL PROTECTION AGENCY

Wastewater Treatment Grants Program

Section 210 (g)(6) of the Clean Water Act Amendments of 1977, P.L. 95-217, includes a provision to help communities obtain important recreational benefits at relatively little cost. The so-called "Burdick Amendment" requires communities planning sewage treatment improvements with Federal assistance to evaluate the potential for multipurpose recreational development in the sewer right-of-way. Some areas have quickly used the provision to begin bikeway planning (the EPA program includes no funds for construction) between population centers, water bodies and recreation areas. Although consultation with the Department of the Interior is encouraged, the corridor need not be part of a formal recreation plan in order to be considered for recreational development. EPA expects to release final regulations describing the program later this year.

Planning assistance provided in this manner has had some impressive results to date. In New York City, EPA is providing staff and other support for the upgrading of a 21-mile bikeway corridor between Brooklyn and Queens, connecting schools, fishing piers, and recreation areas. The Town of Grand Isle, New York, has begun planning with EPA assistance for a bikeway link between two state parks, a school, civic center and other facilities in a 1½ mile highly developed recreational corridor, terminating at a state park. The Grand Isle project, planned for construction in 1979 at a cost of $238,000, is funded by the Department of the Interior and the New York State Department of Parks and Recreation on a 50-50 basis.

The Water Division of any EPA Regional Office can provide further information about particular multi-purpose grant proposals in its area. A booklet on the program, "The Public Benefits of Cleaned Water: Emerging Greenway Opportunities," and a list of state water resources offices are available from Mr. John Gerba, Office of Land Use Coordination, A-101, U.S. Environmental Protection Agency, Washington, D.C. 20460 (202/755-8835).

NATIONAL ENDOWMENT FOR THE ARTS

Architecture, Planning and Design

Under a program established in 1976, the National Endowment for the Arts (NEA) will provide grants on a matching basis of up to $30,000 to organizations including non-profit institutions, universities, and State and local government agencies to promote excellence in design quality. As part of this program, NEA provides "Livable Cities" grants aimed at improving the quality of the built environment through practical and innovative projects relating to city design. Grants are awarded on the basis of the beauty, impact, and innovation of the proposal, and transferability to other communities.

Only one out of ten proposals received is selected for funding under this competitive program. One of the successful proposals implemented with the assistance of a $15,000 "Livable Cities" grant linked commercial facilities with bicycle, pedestrian and park facilities in a six-block central business district development project in Miami.

Design, Communications and Research Programs.

In addition to specific grant programs, NEA also awards grants on a matching basis to non-profit organizations for a broad range of activities in the areas of design, communications and media projects, and various research activities. Assistance is provided for the conceptual development of such activities, and not generally for capital improvements. According to NEA staff, the development of workshops on bikeway design or a project to develop graphics for a bicycle route might be possible applications for these funds. Design fellowships of up to $10,000, requiring no matching share, are also awarded to professional designers of exceptional talent for the study of independent design projects. NEA's "Guide to Programs" booklet describing these kinds of grants is available from the Public Information office, National Endowment for the Arts, 2401 E Street, N.W., Washington, D.C 20506.

DEPARTMENT OF HEALTH, EDUCATION AND WELFARE

Safety Education Program

Title IV of the Elementary and Secondary Education Act of 1974 (P.L. 93-380) provides in section (C) for the funding of "innovation and support" in the area of safety education. Grants, which require no matching share, are allocated to states on the basis of school-age population, and administered by Title IV Coordinators in each state. Priorities and procedures for each state are determined by the Coordinator and the State Department of Education; size of the grants varies. Applications are submitted at designated times established by each state coordiantor. In all states, funding goes to school districts (not to individual schools) for a three year period. At the end of the three years, states may continue funding the more successful programs on a demonstration basis; or the school district will (in about 55% of the cases) take over the funding.

Under earlier programs in HEW, fairly substantial grants (such as a three-year, nearly $300,000 "Bicycle Safety Town" in Sterling, Illinois) were the rule. Now, however, the trend is toward smaller grants (some States have established ceilings) to facilitate the eventual assumption by communities of these safety education activities.

Education officials interested in using HEW Title IV funds for bicycle safety should work with their superintendent of schools and the state Title IV Coordinator. A list of the State Coordinators is available from: U.S Office of Education, Division of State Educational Assistance Programs, 400 Maryland Avenue, S.W., ROB 3, Room 3010, Washington, D.C. 20202.

DEPARTMENT OF COMMERCE

Public Works Grant Program

The Economic Development Administration (EDA, formerly the Area Redevelopment Administration) was established in 1961 in the Commerce Department to combat widespread poverty and unemployment. In 1976, a massive ($6 billion) public works program, now at its spending peak, was initiated primarily to assist the nation's sluggish construction industry. These

grants have provided thousands of communities with a wide variety of public works projects, mostly serving water, sewage, educational and recreational needs. Cities receive their allocation in a lump sum and apportion it to projects of their choosing — which, in a few cases, have included bikeways. EDA provides no technical assistance and staff does not get involved with bicycle planning.

If extended, the EDA program could provide areas with high unemployment or low family incomes with an additional funding source for labor-intensive projects.

In Prescott, Arizona, a $40,000 bikeway was constructed with EDA money to connect two City parks, Yavapai College and a Veterans Administration hospital. Flint, Michigan utilized part of a $670,000 EDA grant to build a ten-mile bike path, including rest areas and landscaping. The path is heavily used and will eventually link renewal areas. Flint is involved in extensive urban renewal work using HUD block grant funds, EDA grant funds and a grant from the National Endowment for the Arts. New construction resulting from renewal activities is expected to increase bikeway use. An interesting feature of the Flint EDA project was use of Department of Labor CETA funds for the City's matching share.

In addition to EDA's public works grants, assistance to communities for bikeway maintenance may be available with implementation of the Administration's urban policy initiatives, which would include a three-year, $3 billion labor intensive public works program to help urban areas repair and rehabilitate public works.

Brochures describing the EDA grant and technical assistance programs are available from your EDA Regional Office or by writing to: Economic Development Administration, Office of Public Affairs, 14th and Constitution Avenues, N.W., Room 7019, Washington, D.C. 20230

DEPARTMENT OF ENERGY

Appropriate Technology Small Grants Program

Section 112 of the Energy Research and Development Appropriation for FY 1977 (P.L. 95-39) established a program in the Department of Energy for relatively small grants (up to $50,000 each) to be awarded to individuals, small businesses, local nonprofit organizations and Indian tribes to support small-scale technologies that are (1) inexpensive and simple to construct, (2) easy to maintain, (3) environmentally sound, (4) consistent with local energy needs, and (5) dependent on local resources and manpower. Although most grant proposals received so far are oriented toward energy research, innovative bicycle-oriented proposals aimed at conserving energy (for example, creation of a bike coordinator's position for small businesses in an area) could be considered for funding under this program.

In a pilot demonstration now underway in the DOE Region X Office (California, Nevada, Arizona and Hawaii), 108 proposals have been selected (none believed to include bicycling) from the over 1100 received. Few restrictions are placed on the use of the grant money, (averaging $12,000 per grant) which may cover such expenses as materials, planning, acquisition of land, and salaries.

All DOE Regional Offices will eventually participate in this small grants program. Proposals will be evaluated first for technical feasibility by DOE program specialists, and then by a panel of non-government employees, small businessmen, planners, and others familiar with community needs. Selections will be made by Regional Offices on the basis of the panel's recommendations and other factors such as technology mix, qualifications of applicants, and geographic distribution of projects.

At the present time, Regional Program Managers have been established in DOE Regions 1, 2, 5, 9, and 10, which have available program announcements and application booklets. The program is expected to be fully operational by the end of the year. DOE Regional Offices may be contacted for information about the status of the program in your area. Final Regulations on the program, published in June, may be obtained by writing to: U.S. Department of Energy, Freedom of Information Office, Washington, D.C. 20545.

DEPARTMENT OF LABOR

Employment Programs

The Comprehensive Employment and

Training Act (CETA) of 1973 (P.L. 93-203) provides funds to municipal governments of areas of more than 100,000 population to create new jobs in a variety of fields and to continue services that cannot be supported with local funds alone. A number of cities have used portions of CETA grants, which require no local matching share, to provide salaries for bicycle coordinators and for other special bicycle-related projects.

Areas with at least 6½ percent unemployment are eligible for assistance under Title II of the Act (which funds Seattle's present coordinator, for example). Special projects lasting one year may be funded under Title VI. One such project in Portland, Oregon included the funding of three persons to develop a bicyclist information package.

The primary CETA sponsor in each metropolitan area (usually, a coalition of governments) may be contacted for information about the possibility of funding bicycle planners and coordinators in city and county governments with these grants. Brochures containing general information about the CETA program are available by writing to the Office of Community Employment Programs, Room 5317, U.S. Department of Labor, 601 D Street, N.W., Washington, D.C. 20213 (Attn. Emma White).

DEPARTMENT OF AGRICULTURE

Watershed Protection Program

The U.S. Department of Agriculture administers under authority of the Watershed Protection and Flood Prevention Act of 1954 (P.L. 83-566) a 50% matching grant program aimed at providing technical and funding assistance to state and local governments for various water-related conservation projects, which have included bike trails and other recreational facilities. Under this program, administered by the Soil Conservation Service (SCS), localities in need of funds for watershed management purposes may seek grants through local government sponsors, who let contracts for the work or request SCS staff assistance. On-site technical assistance may be obtained for incorporating recreational facilities into an overall watershed management proposal (such as soils analysis to determine the type of construction activities most suitable for the area).

The Watershed Protection program is limited by law to small watersheds of 250,000 acres or less, and projects must be related in some manner to water conservation objectives, although some flexibility is permitted. For information about possible application in your area, contact any state or local SCS office, or write for brochures to: Information Division, Soil Conservation Service, U.S. Department of Agriculture, P.O. Box 2890, Washington, D.C. 20013.

Resource Conservation and Development Program

The Soil Conservation Service administers an additional grant program, somewhat broader in focus than the Watershed Management Program, which was established by the 1970 amendment to the Bankhead-Jones Farm Tenant Act (P.L. 91-343). SCS staff assistance was provided for resource conservation and development (RC & D) projects to develop economic opportunities and improve the quality of the environment through the conservation of natural resources. These projects are not restricted to water conservation improvements, and are generally planned and administered on the multi-county level. Projects such as bikeways along beach or marshland improvements might be considered suitable for SCS funding.

RC & D projects, as a rule, go through a less restrictive approval process than the watershed projects, although Congress sets a limit on the number of resource development proposals that can be approved each year. Local initiative to plan and implement projects is essential, and construction may proceed rapidly once approval is granted. A bicycle and jogging trail now under construction was included in the Assupink Watershed Project in Princeton, New Jersey, and plans for the recently approved Tri-Creek Watershed Project in Wisconsin will incorporate bicycle trails and shelters along a number of water bodies.

Brochures describing possible uses of RC & D funds are available from the Ecological Science and Technology Division, Soil Conservation Service, U.S. Department of Agriculture, P.O. Box 2890, Washington, D.C. 20013, or from the State or local Soil Conservation Service office in your area.

Section 4(f) of the Department of Transportation Act of 1966, as amended

49 U.S.C. 1653(f)

Maintenance and enhancement of natural beauty of land traversed by transportation lines

(f) It is hereby declared to be the national policy that special effort should be made to preserve the natural beauty of the countryside and public park and recreation lands, wildlife and waterfowl refuges, and historic sites. The Secretary of Transportation shall cooperate and consult with the Secretaries of the Interior, Housing and Urban Development, and Agriculture, and with the States in developing transportation plans and programs that include measures to maintain or enhance the natural beauty of the lands traversed. After August 23, 1968, the Secretary shall not approve any program or project which requires the use of any publicly owned land from a public park, recreation area, or wildlife and waterfowl refuge of national, State, or local significance as determined by the Federal, State, or local officials having jurisdiction thereof, or any land from an historic site of national, State, or local significance as so determined by such officials unless (1) there is no feasible and prudent alternative to the use of such land, and (2) such program includes all possible planning to minimize harm to such park, recreational area, wildlife and waterfowl refuge, or historic site resulting from such use.

Pub.L. 89-670, § 4, Oct. 15, 1966, 80 Stat. 933, amended Pub.L. 90-495, § 18(b), Aug. 23, 1968, 82 Stat. 824.

UNITED STATES DISTRICT COURT
DISTRICT OF MASSACHUSETTS

MEMORANDUM AND ORDER
on
Motion of Debtor's Trustees for Authority to
Abandon the Lexington Branch Line of
Railroad in Massachusetts

MURRAY, Senior District Judge

The motion of Debtor's Trustees for an order authorizing the Trustees, pursuant to Rule 8-512(b) of the Bankruptcy Rules, to abandon the Lexington Branch came on to be heard on January 3, January 8, March 27 and April 29, 1980, after notice given by order of the court in accordance with 11 U.S.C. § 1170(c) of the time and place of the hearing. Evidence was presented on behalf of the Trustees and on behalf of E. W. Larson & Sons, Inc. (Larson), a shipper on the Lexington Branch opposed to the abandonment, and the court heard their oral arguments and considered their memoranda.

Accordingly, it is hereby Ordered that:

1. In the best interests of Debtor's estate and consistent with the public interest the Trustees are permitted to temporarily discontinue freight service over the Lexington Branch during the construction by MBTA of its rapid transit extension system to the Alewife Brook Parkway locus, subject to the conditions set forth in this Order.

2. Upon the actual discontinuance of freight service authorized by this Order,

a. the conditions for the protection of employees discussed in Oregon Short Line R. Co. - Abandonment Goshen, 360 ICC 91 (1979), and referred to in the certificate and decision of the ICC filed in this case, shall be complied with.

b. the Trustees shall provide the ICC with the information specified in the order included in its certificate and decision filed in this matter.

c. the Trustees shall not permit any part of the rail, track, ties or structures of the Lexington Branch used for freight service to be dismantled or removed from the right of way, except approximately 1300 feet of track, and the signal system accessory to the track, lying in West Cambridge and East Arlington, to permit construction by MBTA of the complex consisting of the garage and subway station described in this Memorandum.

d. the Trustees shall cooperate with the freight shippers remaining on the Lexington Branch in providing reasonable rail service at alternate public delivery track facilities at Cambridge and Waltham.

e. the Trustees shall report to the court, within six months, the progress of the MBTA construction of the complex consisting of the garage and subway station at the Alewife Brook Parkway locus described in this Memorandum, and of plans for extension of rapid transit beyond the locus or of other use of the Lexington Branch corridor.

Freight service - bikeway joint-use capability

When it's in operation, the freight service uses the portion of the Lexington Branch from Alewife, at the Cambridge/Arlington line, to Mill Lane in Arlington Heights, approximately 3.5 miles of the proposed bikeway. The narrowest part of this portion of the right-of-way is 20 feet. This is at Arlington Center, where it has been recommended that the bikeway be diverted from the right-of-way and integrated into the existing traffic-flow pattern. Doing so, of course, would help get cyclists through this intersection in a manner that is safe both for them and for drivers.

Should the freight service resume operation after completion of construction at Alewife, the bikeway could share the right-of-way with the train if the proper precautions are taken. These would include the construction of a barrier between the tracks and the bikeway, and other features such as signs and/or easements.

Other than the segment of the right-of-way at Arlington Center, this portion can accommodate these two uses with little or no conflict. The one exception might be the segment between Grove and Brattle Streets in Arlington. This segment is only 30 feet wide. However, an on-site survey conducted during the course of the study shows that sufficient land does exist adjacent to the right-of-way to accommodate the proposed bikeway. It is possible in this instance that an easement would be necessary to resolve the problem of the lack of space within the confines of the right-of-way.

The following table indicates the width of the right-of-way by segment, from Alewife to Mill Lane in Arlington Heights.

TABLE 7

Right-of-way Width from Alewife
to Arlington Heights*

Segment	Width in Feet
Route 2 to Lake Street	66
Lake Street to Linwood Street	40
Linwood Street to Whitmore Street	66
Whitmore Street to Water Street (Arlington Center)	20
Water Street to Mill Street	82
Mill Street to Grove Street	45
Grove Street to Brattle Street	30
Brattle Street to Forest Street	56
Forest Street to Mill Lane	56

*Source: Right-of-Way and Track Maps for Lexington Branch.

MASSACHUSETTS
BAY
TRANSPORTATION
AUTHORITY

50 High Street, Boston, MA 02110

RECEIVED
NOV 19 1980

November 17, 1980

Mr. Donald E. Megathlin, Jr.
Executive Director
Metropolitan Area Planning Council
44 School Street
Boston, Massachusetts 02108

Dear Mr. Megathlin:

The MBTA supports the concept of developing the Minuteman Commuter Bikeway along the Lexington Branch Right-of-Way, with certain conditions.

As you know, this right-of-way was purchased with funds made available by UMTA and is part of the Commonwealth's plan to reserve rights-of-way for future mass transportation functions. With this in mind, the MBTA is not interested in giving up any transportation rights which we presently enjoy. However, to the extent that a commuter bikeway is compatible with this basic premise, we support a joint use of the right-of-way.

MBTA Development Staff are prepared to work with you and with the affected towns to develop this proposal in more detail.

Very truly yours,

Barry M. Locke
Governor's Designee and
Chief Administrator

cc: James O'Leary, EOTC
Richard Dempsey, MBTA
Donald Marquis, Town of Arlington

ABOUT THIS REPORT

The Minute Man Commuter Bikeway Study report was prepared by the Metropolitan Area Planning Council and the Central Transportation Planning Staff under the supervision of the Executive Director. The Metropolitan Area Planning Council is a regional-planning council, made up of chief elected officials from 101 greater-Boston cities and towns, 11 state-agency representatives, and 21 gubernatorial appointees representing minority and consumer interests. MAPC works with communities on matters important to the greater-Boston region, such as housing, land use, transportation, economic development, water and air quality, energy, hazardous materials, noise, and solid waste.

The preparation of this report was funded under the EPA Clean Air - Transportation Planning Program, administered by the Urban Mass Transit Administration. UMTA Contract Number: MA-19-0006

Additional copies of this report are available from:

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44 School Street
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